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To Get Somewhere Else*

Alan R. Moritz, M.D., Cleveland, Ohio

> "Now, *here*, you see, it takes all the running *you* can do to keep in the same place. If you want to get somewhere else, you must run at least twice as fast as that!"
>
> Through the Looking Glass. Lewis Carroll

Almost everyone, if asked, would profess to favor virtue and to be opposed to sin. The trouble is that too few people are really willing to do more than express a preference. This Academy is the only organization in this country which was created to improve the application of all disciplines of science in the administration of justice. I suspect that everyone concerned with the use of scientific evidence in forensic proof-making would profess approval of the objectives of the Academy. Inertia is probably the principal explanation of the fact that only about a third of the members of the Academy attend its meetings or contribute to its program.

This brings me to the sage observation that the Red Queen made to Alice. Even those of us who want no more than to stay in the same place must run fast. If the Academy is going "to get somewhere else" we had better start running twice as fast.

I believe that this organization by reason of the scientific heterogeneity of its membership can accomplish certain things that no other organization in the United States can do. One thing that we should do is to conduct our annual scientific program in such a way as to derive maximum benefit from the diverse talents of our members. Another thing that we should do is to use the prestige of the Academy to bring about

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* Presidential address presented at the Ninth Annual Meeting of the American Academy of Forensic Sciences, February 28, 1957, Chicago, Illinois.

such procedural and other changes as are needed to improve the utilization of scientific evidence by our courts.

Annual scientific program. I believe that we should devote a larger part of our program to a carefully planned and well integrated multi-discipline consideration of various important medicolegal problems. An excellent example of this type of program is the Symposium: Traffic Accidents. In our sectional meetings, pathologists talk to pathologists, psychiatrists talk to psychiatrists, and document experts talk to document experts. Some of this is excellent but it is not the sort of thing that we can do better than any one of several other national groups. This year, for example, each of three different national associations of pathologists are putting on excellent programs in the field of forensic pathology. They can do this as well as we can. It is easily possible that the same is true of several other sections.

The gathering of scientific evidence and its utilization in forensic proof-making usually involves more than one type of expertness. When several experts are working on a problem it is essential that there be cooperation rather than competition. Certainly, modern scientific criminal investigation is never a one-man job, nor can it be done effectively by a group of experts operating as individuals rather than as a team. The Academy is the only organization whose membership represents all of the various fields of forensic science. We are the only team with a full complement of players and we should capitalize on the fact that we can study problems as a team.

In this connection I suggest that more time be given in our annual sessions to the presentation of recent advances in the various fields of forensic science. I, for example, do not spend the time I should in reading the recent advances in a field so close to my professional interests as toxicology. Anything I learn about the recent advances in criminalistics or document examination is entirely fortuitous. I believe that the program of our annual meeting would be greatly strengthened if one member of each section were invited to present a report at the general session dealing with recent advances in his field. Moreover, I believe that the publication of such reports would greatly enhance the value of the Journal.

Other activities. Our founders charged us with the responsibility of improving the practice, elevating the standards

and advancing the cause of forensic science. What are we doing about these things other than the holding of an annual meeting and the publication of a journal? So far as forensic pathology is concerned, your representative, Doctor Ford, has worked unremittingly and effectively with representatives of other groups for the establishment of a certifying board and for means of improving training programs in this field. There probably are other divisions of forensic science that should take steps to establish standards for certification and training of experts. Each section should give thought to this matter and should move in the direction of creating a competent certifying procedure.

As experts in forensic science we have a moral obligation to defendants in criminal proceedings which is largely undischarged. I refer particularly to the pathologist, toxicologist and criminalistic expert. In most communities, the only persons who are truly expert in the forensic aspects of these fields are those who are in the employ of the county or state. However conscientiously the state's expert may try to be fair, he is still the prosecution's witness. I think that the defendant deserves to have someone other than the state's expert evaluate the scientific evidence in his behalf,—someone who is both competent and honest and who will serve as witness for the defense if, in his opinion, the scientific evidence has not been correctly or fully presented by the state. This problem deserves study because it is obvious that forensic science does not exist for the exclusive benefit of the prosecution. It is also a fact that even the most experienced forensic scientist is not necessarily infallible.

This is the 9th annual meeting of the Academy and that sounds like an adequate gestation period. It is my impression that too many of us have left too much work for too few to do. If this organization is going to move ahead, and this it must do or perish, the most of us, like the Red Queen, will need to double our pace.

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PLAN TO ATTEND THE TENTH ANNUAL MEETING OF THE AMERICAN ACADEMY OF FORENSIC SCIENCES

February 27, 28, March 1, 1958

Cleveland, Ohio — Hotel Carter

Tentative Program in This Issue

Symposium on Traffic Accidents*

Participants: *Maier I. Tuchler, M.D., Psychiatry; Frederick L. McGuire, Ph.D., Psychology; Richard Ford, M.D., Pathology; Henry C. Freimuth, Ph.D., Spencer R. Watts, B.Sc., and Russell S. Fisher, M.D., Toxicology; Frank Stratton, B.Sc., Criminalistics; Edward C. Fisher, LL.B., Law*

Personality Factors in Traffic Accidents: Psychiatric Aspects

Maier I. Tuchler, M.D., San Francisco, California

A philosopher on his deathbed is reported to have muttered: "What is the answer—what is the answer?" Abruptly he sat up and said: "What is the *question*?" Whereupon he died.

And so it seems to me, after a year's study of the psychological and psychiatric literature on traffic accidents, that everyone has been seeking answers, but seem confused on the "questions." My understanding of the causes of traffic accidents has certainly decreased in almost direct proportion to the volume of articles perused. A welter of data has accumulated on every conceivable topic, from the shape and color of a traffic signal to field-of-vision tests, word association tests, motor coordination responses, glare recovery reaction time and the prevalence of dexedrine usage without prescription by truck drivers. So much work has been expended on the periphery. The basic question, it seems to me, involves the personality of the man behind the wheel. Question: *"How is this personality related to accidents?"*

The approach which I wish to present, in contrast to the statistical and experimental aspects of the automobile accident studies, is essentially a psychiatric study. The task is to evalu-

* Presented at the Ninth Annual Meeting of the American Academy of Forensic Sciences, February 28, 1957, Chicago, Illinois.

ate the functioning of the total personality in his normal setting.

There are distinct limitations in the study of individuals involved in accidents. While our goal—as is the goal of all science—is to predict on the basis of objective studies the probabilities for accident in a given individual, this, at the present stage of our knowledge, we cannot do. I have attempted in this paper to approach the problem after a good many months of preparatory study of the psychological and psychiatric literature of motor vehicle accidents. A brief summary of the more significant papers in the literature of traffic accidents will serve in introduction.

Some Statistics

In 1955, traffic accidents caused 5,000 more deaths than the total American fatal casualties in the Korean War. The traffic accident is the sixth major cause of mortality in this country, and is the greatest single cause of death in individuals under 28 years of age. In 1954, it was estimated that the death toll from traffic accidents had already exceeded the total number of war casualties in the United States in its entire history by about 64,000; by now this figure must be over 100,000. Statistics indicate that the most accidents occur in reasonably good weather and road conditions, and that 90% of the vehicles involved are in good mechanical condition.

The most important causes of accidents involving fatalities include: Traffic violations—including speeding, which is responsible for 30% of traffic accidents; physical impairment and psychological handicaps. Of the physical impairments, visual limitation and particularly impairment of the field of vision increases in proportion to the speed.*

One of every fourteen drivers involved in a fatal accident has a physical condition which has something to do with the

* At extremely high speeds a psychological factor enters, in addition to the psychological handicap of the individual, known as high-speed hypnosis. This so-called high-speed hypnosis is actually a self-induced preoccupation in the extreme, which slows down the ability of the individual to react to that which he actually sees. At high speed an individual is aware of the significance of small movements, but his preoccupation, which is necessarily part of a hypnoid state, is extreme.

cause of the accident. Fatigue is present in at least 60% of these fatalities. Defective eyesight, defective hearing, excessive alcohol intake, accounts for 24% of fatal accidents.

Review of the Literature

The studies summarized by Forbes (1), while stressing the importance of visual tests, tests of reaction time, depth perception, eye-hand coordination, glare blindness, are rather confusing. Correlation between these strictly psycho-physical experiments and the incidence of accidents is not at all convincing. Regarding research on statistical correlation tests, the majority of the tests utilizing statistics hold up on group studies but fall down on individual studies. The majority of the studies conducted by the Center of Safety Education (2) did not show any stable traits or characteristic defects which could be highly related to accident occurrence.

On the other hand, the clinical approach involving psychological and psychiatric studies of traffic violators and of accident-prone individuals presenting maladjustment problems seems valuable. MacFarland (3), studying truck drivers, agreed with Tillmann (4), (4a) to the effect that family, social, economic and personal maladjustments are found most frequently in the high accident group of drivers. Personality traits of aggressiveness, self-sufficiency and emotional instability do show some statistically significant correlation.

As early as 1941, Lowell Selling (5) and Canty (15) utilized psychological and psychiatric study and treatment of chronic offenders, which they studied in the Recorder's Court in Detroit. Their work was a pioneer study and was of great value.

Although several theories, one by Walsh (6), have interpreted accident frequency distribution to indicate that a few consistently accident-prone people cause most of the accidents, a considerable amount of research has thus far failed to uncover those traits by which these individuals could be differentiated from the "normal" population. It was found that individuals who were accident-prone at one time did not, in a later study, account for a majority of accidents. In fact, the reverse was true, for those individuals who at one time were considered accident-prone could account for only a very

small portion of accidents in a later accident study. On the basis of statistical study, the trait of accident-proneness does not seem as yet to have been substantiated. On an individual basis, it may be a decided factor.

Tillmann (4) noted that the psychological approach to the problem of the accident-prone by the study of isolated psychological factors had failed to differentiate the accident-prone from the low-accident driver. Tillmann studied (by interview) personality traits and discovered the high correlation in the high-accident taxi driver of impulsive behavior and immature traits of character, quite in contrast with the stable and mature pattern displayed by the low-accident driver. A study of the social adjustment of 100 truck drivers showed that 60% of accident repeaters had a record of anti-social behavior, in comparison with only 9% of the low-accident drivers. A study of 37 truck drivers who displayed, as a group, remarkably low accident rates, demonstrated that these men fully justified the criteria used in hiring them. They had been selected primarily for their stability, their mature living habits, and secondarily on the basis of their physical good health and driving skill. Tillmann (4) indicated that the habits most necessary for good living were also of importance in safe driving, and he concluded that accident-prone drivers can be detected by their living habits, since "a man drives as he lives."

The personality profile, as presented by Tillmann (4), involved a family history, childhood adjustment, school history and work record; social adjustment, sexual adjustment, etc. The man with a high accident frequency had a high parental divorce rate, with evident gross disharmony among the parents. A parent was often alcoholic and a poor provider. In childhood, the high-accident individual was unstable, overaggressive, had temper tantrums, was bullying, frequently was involved with the juvenile court. School history showed truancy and disciplinary infractions; he usually left school early, frequently after failing. The work record involves frequent short-term employments, poor adjustment to employment and often following the line of least resistance in seeking employment. Social adjustment is meager, the individual needing to be the center of attraction and having few interests and few

friends. Sexually, marriage is unstable and frequently involves casual extramarital relationships. Insofar as previous health was concerned, there were no characteristics separating either group. The behavior pattern of the accident-prone individual, however, was markedly immature. His driving habits featured an easy distraction, annoyance with other motorists, a tendency to criticize in others his own driving mistakes, and to use his horn excessively. There was usually interest in the mechanical side of his car, and he had no fears whatever of the mechanical limitations of cars. This is rather interesting, for the safe driver frequently shows little or no mechanical familiarity.

Tillmann (4) sees that the impulsiveness and the unwillingness to accept responsibility are characteristics of normal youth as well as abnormal immaturity. Youth express a desire to lead rather than be led and resents discipline. A desire for recognition and individuality makes him act impulsively. He seeks adventure. Steady jobs, routine, monotony, long deliberated decisions, are looked upon as dull. He drives as he lives. What better place for him to attempt thrills than behind the wheel of a car? As he matures his impulsiveness becomes controlled, he tends to develop an awareness of the rights and privileges of others and soon conforms to the standards of the group. In the immature adult driver, this transition has not occurred.

Concerning the driver with repeated accidents, Tillmann (4) briefly outlines the individual as a product of an unfavorable home environment with parental discipline meager or inappropriate, and disharmony among the parents marked. Excessive discipline by over-strict parents ingrains in him resentment of authority. He learns to consider himself as reacting with antagonism, and he frequently uses every opportunity to establish his "independence." In childhood he may have demonstrated temper tantrums, a desire to dominate in a bullying fashion, and these tendencies were apparent in the school record, involving disciplinary infractions, truancy, juvenile delinquency and frequent court charges. His occupational record may be shifty, habits are selfish. He has few friends, ignores responsibility to his family, frequently fails to conform to financial obligations, focuses attention on im-

mediate values, fails to learn from experience in the past and disregards the future. He may be superficially suave, but underneath he is selfish and impulsive, lives for himself, is willing to jeopardize the security of others in order that he may satisfy his own wishes. Chronological age and experience play little part. His faulty attitudes "have fouled him many times in his social adjustment, have caused him to leave a deep imprint in accident records."

Professor Perin (7) of the Department of Psychology, Miami University, who has long been interested in traffic safety, states: "Careful analysis of driving characteristics, accidents and human qualities lead us inescapably to the conclusion that the bulk of the psychological problem lies in the emotional and in the broader personality side of the individual. Unfortunately this is the most difficult of all to investigate and to understand. Wrapped up here we have all of the personal motives, the individual conflicts, the frustration reactions, the wishes and the desires. When considered in the light of the constant change the human being is undergoing, we see why it is so very difficult to predict driver performance.

"The individual who has a good understanding of psychological factors affecting himself and others will be on guard for the other psychological aspects of driving. For instance, he will be aware of the dangers resulting from illusions of motion and direction. In fact, he will be aware that the autos themselves constitute an illusion of safety and stability. An alert individual will have a deep appreciation of the effects of alcohol on driving. He will be on guard concerning fatigue and boredom."

Wisely (8) found in questionnaire studies of accident repeaters and accident-free groups, no important differences with regard to visual acuity, depth perception, recovery from glare, reaction time or mental ability scorings. He found significant differences in the personality characteristics. The accident repeater seemed to react impulsively. This impulsive behavior made adequate decision and choice difficult.

The hypothesis is presented that the accident-prone individual is far more than merely accident prone—that he is a case of serious adult maladjustment, and that one of the

symptoms of this adult maladjustment is his accident involvement tendency.

The Harvard group has offered a most thorough review of the literature of the human variable. MacFarland (19) looks upon the accident from the point of view of an interrelationship between the driver, the vehicle and the environment. This study places prime stress on the importance of the characteristics of the driver, secondarily emphasizes the importance of the integration of the driver and his vehicle and of the interaction between the unit, the driver-and-his-vehicle, and the social environment which represents the roadway, the illumination and the other driver-vehicle combinations.

Again stressing the importance of the driver's characteristics, Halsey (10) writes: "The emotional disturbances probably represent an area of special study, but we are, however, as yet in the stage where it is one thing to fasten upon a specific causation factor and another thing to determine a solution to the problem."

Edmund (11) studied almost 600 truck drivers in a traveling clinic and demonstrated that the young drivers have a more serious type of accident and the drivers under 24 deserve a very intensive training program. Drivers improve gradually between the ages of 19 and 36, and the best drivers range in age from 36 to 45. Interesting points were noted in this research; although the younger drivers have keener vision, they fail to take precautions, whereas drivers with faulty vision have either very poor or exceptionally good accident records. A man aware of his impaired vision is usually more careful. A factor of little significance is reaction time and distance judgment.

Another paper deals with attention, a concept from the antiquated point of view that attention is a sort of searchlight which can be thrown upon this thing or that thing in the environment to see them better. According to Van Lennup (12), attention is the way we relate ourselves to objects on the basis of the meaning they have for us when we perform the task. The automobile, according to this theory, remains a sort of marginal conscious situation while the driver, as part

of the automobile, is concerned with the road ahead. If the automobile were the field of attention, very little could be achieved in terms of adequate driver performance. The adjustment to the individual in the car must be practically an unconscious one. In this sense skill and learning are significant. The complex of the driver and the road is never static, but is constantly changing. There is a very definite Gestalt here, from figure to background. The social world must also be considered, including the courtesies, etc., involved in living with individuals. The author describes an unspoken language of the road in which a driver feels where others want to go. This is of the nature of intuition and involves anticipation, judgment and identification. This author also says we drive as we are. Our social attitude finds adequate expression in the concept of our responsibility. Traffic is not a game of luck. The road situation is part of a social world. The other users of the road are fellow men. Of importance is the realization that a driver presents his behavior to other users of the road. The individual who is aware of his behavior, who pays attention to the traffic situation, and takes into consideration that the driver ahead has intentions of his own, becomes at least a responsible driver. He describes the strong aggressive tendencies, the personal irritabilities, the destructive and unconscious tendencies which lead to accidents. He emphasizes the "almost accident," and defines "the common sense minimum" as that little percentage of permissible safety when, for example, a man overtakes another car. At a certain position there's a good possibility that he may not make it: this is the minimum. If he overtakes beyond this he is at fault, and accidents are prone to occur. Some people are not aware of this common sense minimum; some know, but don't care.

Criticism of Literature

It is noted in a study of the literature that despite the almost constant finding that there is a high degree of correlation between the personality of the driver and his accident rate, few if any concrete suggestions are made in respect to evaluating and testing the personalities of potential drivers *before*

they wind up as repeaters in traffic courts or mangled mass murders in morgues. Aside from a few reaction tests very little is known of the personality of the driver. Not until exhaustive studies are made on the personalities of the individuals involved in traffic accidents, studies which include a psychological battery, a physical and neurological examination, visual studies and comprehensive psychiatric study, will we be prepared to evaluate with some accuracy causes of accidents. The Tillmann (4a) paper points the way, and Selling (5) has led the way in his Detroit studies; yet very little has been done following this productive approach. I am at a loss to understand why, and trust that this symposium may help to explain the dearth of research in the *clinical psychiatric approach.*

From our review of the literature a few fundamentals appear to reverberate. The stable, reasonably mature individual with an adequate control of his emotions is recognized at work, at his social relationships and within his family circle as competent and adequate. When this man takes the wheel of his car his personality does not change. He is responsible for his behavior, he is calm, concerned for the welfare of his family and, obviously, for his own welfare, and he is considerate of the rights of others. "He drives as he lives."

The unstable individual presents decidedly contrasting traits of personality. At his work he may have difficulty in getting along with fellow employees; he may be rather itinerant in his habits; and his home life is characterized by instability and undependability. An atypical example occurred on the highway between Palo Alto and San Francisco several days ago. A police officer apprehended a man driving at 85 miles per hour and gave him a ticket. After receipt of his first citation he buzzed away at such speed that the police officer phoned ahead for the highway police to keep a lookout. Twenty-one minutes later he was apprehended at 90 mph; he received another ticket. In a jocular way he asked the State Highway Patrolman the name of the officer patrolling the next stretch of highway. When a third officer stopped him at speed in the 80's, he greeted him by name. This man got along nicely enough with people, but was light on responsibility.

Summary of License Examiner Studies

In doing research in preparation of this paper I interviewed several State License Examiners for the State of California. These gentlemen were unanimous in stating that the problem is almost invariably the personality behind the wheel, and that they were powerless to withhold a license from individuals they felt presented serious internal emotional distress. There seems to be no adequate provision with which a license examiner can withhold a license once an individual passes the elementary written, visual and traffic tests. Taking into consideration the examiner's professional fatigue, there are certain behavioral traits which they, as a group, recognize during the driving examination as danger signals, signals which warrant further investigation. The trial examiners at the Division of Motor Vehicles, while untrained in the lexicon of psychiatry, become extremely shrewd observers of the many personalities whom they meet during the working day. Culling their many statements into a few general principles, this is essentially their point of view: The problem of the bad driver, the one who gets into trouble, who has more than three moving violations a year, is not a problem of vision, of age, sex or status. There is of course, the past-middle-age driver, who has been driving since the automobile resembled a buggy, whose vision is yet of sufficient acuity that he can pass the visual tests and whose facility behind the wheel is still adequate, yet who is constantly in trouble. The problem with such individuals involves their day-dreaming, ready fatigability, stubborness and slow coordination; responses to emergency are markedly impaired. An older person of this type driving into an intersection is apt to run head-on into an approaching vehicle. His reflexes have become so slowed that he may fail to recognize the intersection in time, and once aware of an impending accident, freezes, while his vehicle glides without retardation into the oncoming car. Such older drivers, however, are not typical of their age group as a whole, and their personalities rather than their years seem to be the deciding factor.

At the other end of the age scale, the examiners had little but praise for the average adolescent driver, and also stated that sport car drivers are, on the whole, best able to cope with

traffic problems. The majority of adolescents are responsible young fellows whose interest in their own vehicle is often highly personal, their investment of effort and time in its reconstruction of such moment that their care of the vehicle demands caution and awareness of the problems of the road. Of course here, too, there are exceptions—and they often make the headlines.

The examiners are all agreed that the average individual drives very much as he is. The expert driving teacher and motor vehicle examiner knows when someone is on good behavior, and recognizes also those individuals who are having trouble with temper. Indeed, the majority of failures are not for deficiencies in the rules of the road but are expressions of an individual's *unwillingness to give to others those rights that he demands for himself.* In these cases, however, the Licensing Examiners stated they were powerless to do more than delay the granting of the license. Often, the very reaction of persons temporarily refused a license because of errors in judgment or evident impulsive behavior during the examination, confirms the intuitive judgment of the examiner.

An important element which is of help to the driving examiner is a review of traffic violations. The examiner recognizes that some individuals collect parking tickets and no moving violations, others moving violations and few parking tickets. Some disregard the rules of the road altogether and make their own laws, while others only occasionally exceed the speed limit, often in areas where they are most likely to be picked up. Belligerent, hostile, aggressive personalities become problems when their licenses must be turned in to satisfy the requirements of the law.

Again, from those most intimately in the know at the Automotive Examination Boards as well as from the review of the statistics and studies, it appears that the personality of the driver, rather than his capacity, or age, or skill, plays the dominant role in traffic accident causation.

Diagnostic Types as Related to Accidents

Having decided, then, that the driver's personality is of extreme importance let us look at various personalities,

normal and abnormal, in an attempt to isolate, if possible, those traits which might lead us to expect a greater probability of crack-up in some individuals than in others.

Psychoses and Mental Deficiencies

The presence of an active psychosis or of gross mental deficiency, which should obviously disqualify an individual from obtaining a driver's license, yet plays a significant part in the percentage of individuals involved in fatal accidents. The current tests, while not foolproof, can, if properly applied, screen out most active psychotics or deficients, and this is largely a matter of enforcing already existent laws.

Depressions: The Suicide Crash

Another matter entirely is the suicide crash. In this case the depressed individual turns his destructive, sadistic energy against himself. In the suicide crash—whether intentional or "accidental" but self-induced—the formula "I punish myself" seems appropriate. The depressed individual turns his destructive energy against himself. He presents a powerful and punishing conscience. No one kills himself who has not intended to kill another, even though the other may be one of those original objects which, by identification, make up the superego. Suicide is proof that the tension resulting from the pressure of the superego is unbearable. A depressed person has lost his self esteem, for his ego feels deserted; particularly does he feel deserted by his superego, which instead of supporting him, now punishes. The ego is submissive, the superego cruel. Within the individual is set up a sadomasochistic internal struggle. If the struggle is on a conscious level, and the ego defeated, an intentional, willed suicide may result—the car as well as the self within it—smashed, usually in a spectacular fashion.

Often the desire to punish another, or to extort love, plays a part. We frequently see in normal children a fantasy—"After I'm dead they will miss me—then they will love me." This component plays a significant role in those suicides and near-suicides where the individual is willing to martyr himself to get a fantasied posthumous love.

Often there are more or less specific fantasies associated with the act of dying which may be indicated by the manner and the plan of a suicide act. This is frequently seen in those suicides in which the automobile is driven at high speed. Little is known of the incidence of automotive suicide, yet there is no question that this factor must be considered in our studies.

If the struggle is less conscious, a suicidal accident or near-accident can result, in which the driver is so preoccupied by his bewildering inner tension that he loses control, goes through stop lights, misjudges or "fails to see" the onrushing traffic.

Few victims of the suicide crash have been interviewed in this world. It is necessary to interpolate on the basis of our knowledge what occurs. There have, however, been unsuccessful cases, and it has been my privilege to examine and to treat one such problem. This individual was not a sociopathic person but was a depressed personality with a high tendency toward acting out immediate impulses. In a dilemma with his wife over financial and other responsibilities he flew into a rage, drove away from the house at excessive speed, had no plan or intention to destroy himself but skidded and nearly lost his life. Many months later, in describing his experience, he said quite spontaneously, "If I killed myself she would feel guilty." And he soon recognized that it was his hostility and rage that interfered with his judgment on the one hand, and this very rage was directed at himself at one and the same time.

Last year, while en route to the airport to attend psychiatric meetings, I was riding with a friend when a vehicle swooped into the line of traffic from the feeder road. We were riding on a freeway at 55 mph—legal speed. This vehicle was driven by a young man who was in an argument with his girl friend. The lane was too slow for his mood and he swerved into the center lane without signal. He seemed to be driving his car by the spinner on the wheel. He hit a soft shoulder after a near collision and went on to cross the safety strip, turn over twice, collide with a truck and destroy his life and that of another person. It was easy to see that he was short on the ability to control his temper, and that his mood could be ex-

pressed by the way he swung his steering wheel was evident to all on the highway. As my nonprofessional friend had said, shortly before the smashup, "There is an accident about to happen."

Neurotic Depression and Addiction

There are many lesser forms of self-destruction present in individuals with a considerable sadistic or suicidal component. In the unconscious the wish to murder is the equivalent of murder, so individuals who are constantly hostile, who feel their fate is the result of another's injustice—whether from childhood experience or adult frustration—such individuals possess unconscious murderous, destructive fantasies, and to such there is a potential and constant threat of self-destructive atonement: such individuals must atone for their own hate by their own death. This group often includes drug and alcohol addicts, in fact individuals suffering from all types of addiction. Such individuals frequently seek incarceration (unconsciously) as an atonement for their hostile wishes. Related to this group are those individuals who seek surgical operation after surgical operation, usually needless. In such cases an atonement, whether addiction or imprisonment or needless surgery, represents a self-administered punitive impulse following the formula "I punish myself." The McGuire (13) studies on the accident-prone bear relation to the neurotic depression as outlined.

A clue to the evaluation of the personality factors involved in potentially self-destructive individuals involves study of their character traits which show: (1) the level of their fixation on a clinical maturity-immaturity scale; (2) the prevalence of traits which show regression from a more mature to a more immature state of development; (3) the presence of immediate precipitating factors in the social, economic or sexual life, with significant frustration and depression.

Manic and Hypomanic States

A not uncommon personality constellation seen in accidents are those traits closely related to mania, of which the full-blown character trait is readily recognized as the manic

phase of the manic-depressive psychosis. The fundamental core in the individual with manic-like symptoms is an exaggerated self-esteem coincident with a decrease in feelings of responsibility and a dearth of conscience. In these individuals inhibitions diminish and activity increases and in subtly progressive fashion a stage of excitement is reached, characterized mainly by rebellion against restraint. This type of overexcitement certainly has a social context, for it is frequently seen during festival times. During festivals rebellious, impish impulses are permitted expression, for everyone is celebrating. Our Christmas season is noted for its joyousness. Festivals seem generally necessary, for they represent a period when dammed-up tendencies toward rebellion against mores may be routed along socially acceptable channels of gaiety; our Christmas celebration is based upon the Roman saturnalia, a festival in which orgiastic pleasures were permitted. It is during this period that "one for the road" means "you can have a few extra—everyone's celebrating." And it is just during this period of festival that our highest incidence of destruction occurs. Judgment appears suspended, responsibility decreases as inhibitions decrease.

Neurotic Conflict

Much antisocial behavior and the greater portion of criminal behavior is characterized as an acting out of neurotic conflicts. Activities which have their origin in instinctual drives in man, usually suppressed in the normal or healthy individual, are impossible of suppression in some and occasionally break through with others. Such individuals have had fleeting unstable parental figures so that a lasting identification with a good father is an impossibility and frequently their relations with their mothers were of such an unconstant nature that a stable relationship with a woman in adulthood is impossible. These individuals are constantly misunderstanding the present and seeing it, the present, as a repetition of the past; they seem to transfer persistent attitudes and feelings from childhood to the present and are quite incapable of recognizing what they are doing and why. In analytic terms, their behavior is disturbed in that their relation toward external objects and toward their superego

or conscience is constantly being interpreted in the frame of reference of the significant past, so that behavior consists of acts which constitute unconscious attempts to get rid of or work out, or, as we say today, to act out old impulses, to get present gratification from old impulses and to find relief from constant inner tension. This type of neurotic behavior uses the environment as a stage on which the internal conflict is acted out again and again, sometimes with an awareness that this behavior is against his best interests, but helpless to control his behavior in a conscious manner. Authority is flouted, the individual feels picked on, his freedom interfered with, his goals frustrated. He may appear restless, overactive, or he may mask his difficulties by appearing to be a victim of fate. Some individuals collect injustice and experience passively that which they maneuver. From this group of individuals we gather our highest statistic of accidents.

Impulse-Ridden or Psychopathic Disorders

Another pattern of self-destructive, egocentric behavior involves disorders of impulse. The sociopathic individual, the so-called psychopath, who simulates emotions but feels deprived, who presents a defective conscience and a faulty sense of time, who cannot delay a response but must gratify it *now*, and is a problem to all with whom he comes in contact. He is usually without any neurological or psychological deficiency of test significance. Only his personality as it functions in everyday life, in his experiment of living, gives evidence of what his problems are. He solves his profoundly acute feelings of inadequacy and of immaturity with the most callous disregard for others. If thwarted he demands those rights which he denies others. Much of our criminal population is made up of such individuals, but the performance of a criminal act is not a prerequisite to the inclusion within the group of the sociopathic impulse disorder. Many psychopathic individuals manage to function without the violation of the statutes of society which bring them into institutional and correctional care.

It is error to state that the automobile has created the problem driver, that the violation-prone driver would never

have existed had automobiles not been invented. For the sociopathic individual, whom we recognize on the basis of his impulsive, frequently antisocial behavior is an individual who has neither learned self-discipline nor regard for the rights of others, and therefore constitutes one of our most serious offenders. Such an individual does not learn from experience, lacks a sense of the appropriate and presents a faulty sense of time relationships. What the sociopath desires he must have immediately; he cannot delay. Struggling with deep but constant feelings of inadequacy, he must profess not only an equality, but a superiority. Sadly enough, as the horsepower race increases, he becomes more and more a potential homicide or suicide, for he knows neither control nor reasonable restraint and his judgment is faulty. It is imperative that we make some sincere attempt to pinpoint this type of individual through diagnostic screening and on the basis of his past record, before we further entrust him with a homicidal weapon. As Judge Butler (14) of Chicago has written, "An auto in irresponsible hands is neither a convenience nor a source of pleasure but a weapon." The automobile in the hands of such an emotionally unstable person is as significant a weapon as a machine gun.

Basic Psychodynamic Concepts

In order to understand the point of view of current psychodynamic thinking it appears necessary to bring up one concept—that of the ego and its function—in order to present with reasonable adequacy the normal and abnormal functioning as they relate to the causes of accidents. From the psychodynamic point of view we must recognize the ego as an executive organ or agent of the mind. The concept of ego is an abstraction, a construct; but only through the interposition of such a construct can we adequately interrelate the many forces which go to make up personality.

It is through the ego, as the executive organ of the mind, that the driver expresses his goal. It is through the ego that his instinctual drives as well as his conscience, his awareness of the reality about him, with its pleasures and dangers, are expressed. The hazards of the highway, the carelessness of others, are perceived and evaluated by the ego which, in

maturity, functions with concern for others, and particularly with concern for self. The more the disturbances of immaturity affect the total functioning of the ego, the more an individual is in the grip of his more unconscious, immature, impulsive, historical past. Here lies the fundamental problem.

The individual driver has control of a two-ton vehicle which may potentially be a two-ton weapon. The agency through which his ego expresses his control of this vehicle is his motor equipment—one limb of a complex functioning unit. Another unit of this functioning unit is made up of the totality of his sensory impulses. It seems reasonable to assume that studies of the physical and of the peripheral sensory and motor components, while of importance, can have but limited goals, for such studies focus on peripheral phenomena, however important, and miss the functioning ego, which directs their functioning.

One further concept demands attention. This concept we may call the ego-automobile unit, for the ego perceives the automobile as an extension of the individual driving. Just as a bicycle soon becomes a part of its rider and the two—bicycle and rider—form a balanced unit, so the driver and his automobile become one, and such matters as perception of width of the automobile soon become almost unconscious. It is not necessary to look to the right front fender when passing a car; the driver feels that the fender is his personal periphery. I might say that this concept may be considered, in a belabored way, another aspect of an ego identity.

With this concept in mind let us enter into some of the psychodynamics of the ego-automobile unit. We have already discussed the suicidal traits, the homicidal trends and that irresponsible lack of concern frequent in the sociopathic individual, which may lead to accidents. We have made an attempt thus far to explain psychodynamics and to avoid a purely descriptive psychiatry. The automobile serves as an extension—psychological as well as physical, of the ego of the individual. Behind the wheel an individual can become mighty and the phrase "we drive as we live" might well be, in many cases, adumbrated to "we drive as we *would like to* live." In this concept "would like to" is expressed the core of much of the fantasy life and of the wish-fulfillment that constitutes

the emotional and impulsive, the immature within the normal and in greater degree in those individuals who present psychopathological traits.

The fantasies which an individual harbors regarding his potency, his power, his strength—fantasies often related to feelings of inferiority and finding expression in generalized hostility or rage reactions—can so easily and with such magnified effect be acted out in that common commodity, the automobile.

Psychopathology of Everyday Motoring

Within the limits of the average normal individual there are many satisfactions inherent in the possession and the operation of a motor vehicle. One satisfaction lies in the mastery of the inanimate object, of exercising almost perfect control over a powerful engine under the constantly varying conditions and challenges of the road. That this responds to fantasies of grandeur, even of omnipotence, inherent in so many but finding little if any expression in other aspects of life, is not surprising, nor that the element of domination over others as well as over the machine often enters in. For an increasing number of people driving represents one of the very few activities in which they are free to make their own decisions, and while this is pleasurable to most it fills some with anxiety, whereas others respond with overexuberance and poor judgment. There are responses of a thrill-like nature present in driving. Many a staid driver approaches a dip in the highway with a fantasy that he is on a roller coaster while the kids squeal with delight. In driving an automobile the driver is constantly working out the involved processes of social relationships between people which are commonly called courtesies of the road. The good driver, whose life is in balance, "drives as he is," enjoys the pleasures and accepts the responsibilities of driving, anticipates with a certain tolerance the potential errors of other drivers and responds with quick action rather than with righteousness, stubbornness and delay, when confronted with a sudden emergency. The bad or frustrated driver, whose life is unharmonious, drives as "he would like to live"—uses driving as a substitute for the unfulfilled areas of his existence. If unwilling meekness

characterizes his daily contacts, behind the wheel he may become a tyrant of the road; if his concept of his own life is one of drab isolation, he may seek excitement and thrills behind the wheel. He lets his car make up for his own deficiencies, his own sense of insignificance. The realities of the road become distorted when experienced by a driver preoccupied with his fantasy life and when confronted with an emergency, he is annoyed with the interruption and more concerned with who is to blame than with the avoidance of disaster.

For example, let us take the person who drinks before driving. In the euphoria induced by the alcohol, the repressed areas of his personality find uncritical self-expression, his fantasies become, for the moment, "real." He demonstrates a lack of responsibility before he even gets to the roadway and into his automobile, and his recognition of social responsibility with regard to behavior on the highway is impaired. The mature person recognizes inevitable limitations, such as fatigue, and will refuse to drive when he feels his faculties are impaired. He does not expose to chance what is within his personal control.

Let us turn to the juvenile driver for a brief moment. Three factors stand out in adolescence: there is a rebelliousness, a wish to be free from parental restraint, often associated with feelings of omnipotence; judgment may be limited and awareness of the rights of others frequently as yet undeveloped. Certainly the juvenile is often not cognizant of his limitations, for his very omnipotence fantasies blind him to danger. During the war several studies demonstrated that a majority of inductees under the age of 25 had no concept of death as related to themselves. Such feelings of invulnerability point to the validity of the concept of omnipotence fantasies in the young. The reflexes and the visual fields of the juvenile are of the highest. He is responsive and quick in his reactions, but his maturity and judgment have not kept pace with the horsepower at his disposal.

Older drivers, too, sometimes fail to recognize their limitations, continue stubbornly to drive high powered cars despite failing eyesight, slowed down reflexes, increased irritability and decreased muscle power. In fantasy they see themselves

still as young and vital while at the wheel, although in other activities they may have slowed down in keeping with their reduced capacities.

We must, of course, assume a gradient of emotional stability and maturity. The normal individual responds to transient stresses with anxiety and occasionally with regressive phenomena of irritability or compensatory aggressiveness; as we approach the immature and psychopathic individuals, the incidence of instability and potentially impulsive or unrealistic behavior becomes heightened. This appears to have been demonstrated by the statistical studies.

If we recognize the automobile as an extension of the ego, the human body serves to link the functioning mind through the nervous system to the controls. When we consider the importance of the individual's fantasies as expressed behind the wheel, we run bluntly into a contradiction. The science of psychology seems to be defeating its own purpose. Emotional age has no correlation with chronological age. The automobile serves as a powerful substitute for those repressed feelings of mastery, of strength, and of omnipotence, which may be present in the driver. As the horsepower race increases, the accent in automobile sales shrewdly exploits the very psychological factors rooted in the fantasy life of the individual which seem significant in the accident statistics. The appeal of the psychology of advertising seems directed to the *least mature* elements in the driver's personality.

Several suggestions logically follow: A reduction of the potential speed of the motor vehicle follows sound psychological thinking. The psychological accentuation on horsepower, on acceleration, deserves an agonizing reappraisal. Of safety factors it is sufficient to remark that not until last year did one manufacturer begin timidly to stress safety in advertising—and his own salesmen often talked down this aspect (Harper's, Feb. 1957).

Those values which accentuate the conservation of life rather than those values which emphasize the power, the strength and the ability to master deserve to be stressed and made palatable to the buying public. How this is to be accomplished is largely up to the semanticists of Madison Avenue. It has been done in other industries, and an appeal

to the more mature rather than to the childish driver is long overdue.

Psychologists and psychiatrists can also contribute to a decrease in the traffic toll, by a continuing study of those personality traits, normal and abnormal, which seem to relate to accident incurrence—not only a study of traffic offenders, but of all drivers—with a view to the establishment of some form of a personality profile which could serve to screen a large proportion of those drivers whose personality defects might constitute a potential hazard.

Summary

Attempts to correlate accidents to the psychological, mechanical, sensory and motor test responses have been disappointing. Clinical psychiatric studies and psychological research suggest that factors of significance in accidents are found in the social, family, personal and emotional life of the individuals. Clinical studies confirm what psychiatric knowledge postulates: "A man drives as he lives" or—under given circumstances—"a man drives as he *would like* to live."

The core of the problem of the traffic accident lies in a preponderance of the infantile, the immature, the conflict-ridden and hostile traits present in the drivers. The high frequency of accidents with the youthful correlates with their emotional instability, rebelliousness against authority, exhibitionism and lack of restraining experience. Fatigue, while temporary, is of importance, for it hinders functioning of the driver and his vehicle. Alcohol, to a significant degree, and drugs, to a lesser degree, must also be considered.

At the present state of our knowledge the investigation of those traits of character which have their roots in intrapsychic conflict, which are expressed in the tendency to act out such conflicts with the machine as an extension of the individual, seems the *first order of business.* Much of the work to date, while important, has been peripheral or fragmentary.

The question which seems significant when we face the staggering death toll: How can we recognize the personality behind the wheel who endangers his own life and the life of others? What is the thin line between the normal individual of good judgment and of reasonable caution and those in-

dividuals who may under emotional stress (mild or severe) threaten their own and the lives of others?

The ego can be thought of as the executive agent of a personality. None of the current tests to determine readiness for licensure take into account this important fact. This, in effect, is as short-sighted as would be the practice of checking only the car and not the driver. A person's mental and physical faculties indicate only what he is *capable of doing,* not what he is likely to do.

Studies in safety design are now focusing on the interior of vehicles, on the obstructions within the car which have cost so many lives and have maimed so many victims in what are known as "survivable" accidents. In our studies of the human element involved it seems fitting that we, too, examine the "interior" of the driver—those sharp angles in his personality, those projecting obsessions, those psychological blindspots, those unanchored instabilities which, it would seem from all available statistics are every bit as hazardous as trauma-producing knobs, unanchored seats, lethal steering wheels and unsound structure. We should begin to focus on the interior of the individual, the inner workings of his mind, on those delicate balances which constitute the functioning ego. Any less comprehensive outlook offers only a limited solution to the psychological and psychiatric understanding of traffic tragedies.

The psychologist of advertising has made an intensive study of the fantasies and the yearnings, the hopes, the wishes and the desires of the individual. The stress has been placed upon the mean average; the appeal has been made toward immaturity rather than maturity. Let us attempt to direct the attention, the focus of our studies toward a more mature goal for all.

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Traffic Accidents—The Psychological Aspects*

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The problem of highway accidents is just as serious a social, medical, and economic problem in the military as it is among the general population. About one-third of all hospital admissions in the military result from motor vehicle accidents, and during the Korean War the Department of the Navy admitted to the sick list twice as many casualties resulting from highway accidents than as a result of enemy action. The nation is fast becoming desperate in its efforts to discover the cause and cure of this horrible thing that is menacing our health and threatens even the strength of our military forces.

Because of the direction much of our research in this field has taken in the past it becomes necessary to state what are *NOT* the most important causes of highway accidents. *FIRSTLY,* it is not primarily a problem of psychophysics, that is, the role is minimal of such factors as vision, hearing coordination, reaction time, and physical vigor. Thirty years of excellent work has shown conclusively that these items play but a very small part in accident production upon the highway and do not deserve to be emphasized *as such* in any safety program. *SECONDLY,* our problem is not primarily one of road or weather conditions, vehicle defects, or legal enforcement. Less than 10 per cent of highway accident reports even list weather-road conditions and/or vehicle defects as even being present, and in most of these situations

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it can be demonstrated that such factors as failure of the driver to exercise good judgment or to engage in routine cautions were primary causes. Legal enforcement, of all our present techniques, is probably most responsible for whatever progress we have made in the reduction of accidents, and to lessen enforcement would be disastrous. However, this technique clearly cannot solve the problem by itself and probably has reached a point of diminishing returns. *THIRDLY,* our problem is not primarily psychiatric, that is, the mentally diseased individual who requires hospitalization or treatment in order to protect himself and others. Even though the clinical psychologist or psychiatrist may consider most accident-repeaters to be emotionally ill, they are not definable as such by our present cultural and legal norms and hence may not profitably be so classed in any attempt to create and utilize a practical safety program on the group level. *FOURTHLY,* our problem does not stem from the so-called "accident-prone" person or "accident-repeater" who over long periods of time continues to have one accident after another. Accident repeaters contribute no more than 3 or 4 per cent to the accident total.

I do not mean to imply that these aforementioned factors contribute nothing to the accident total or that they should be ignored. However, none of them represent an approach that strikes at the heart of the problem or deals with factors that tend to be related to the majority of accidents. Any definition of a problem, if it is to contribute to the solution of that problem, must deal with generalizations that will serve as guides in the majority of specific situations with which we might be faced, and these particular approaches do not meet this criteria. It is my belief that the accident problem must be defined as one dealing with the attitudes, personality and behavior traits of all drivers, and especially those of the so-called "normal driver."

The "normal" driver is not a gross psychiatric case and he does not possess any particular psychophysical or organic condition that can be said, per se, to make him liable to accidents. He may have only one accident every five or ten years and even then may not be legally charged with responsibility

for the accident. Yet it is just this type of person who produces the vast majority of our accidents, injuries, and deaths upon the highway, and the fact that any given individual may not have repeated accidents within a given space of time does not necessarily reflect his accident potential. The reason for this is that an accident is statistically a rare event. A multitude of factors must operate at a given point in time in order to put a driver in a "frame of mind" that will allow him to commit some error in driving; he has to be actually driving while in this state, traffic and the behavior of other drivers must fit exactly into the pattern, weather and road conditions might have to coincide precisely, and finally another vehicle or obstacle must be in the right spot at precisely the right time in order for the collision to occur. This fact makes its entirely possible for large numbers of people who are ripe for accidents to avoid them for long periods of time or even entirely. Their large number, however, make them a constant threat to all of us.

I would now like to outline some of those personality traits found to be associated with accident production and the implication of these findings for our attack upon the problem. Tillmann's research (1) with high-accident and low-accident taxi drivers showed that when compared against their counterparts the high-accident group were less stable, less mature, and irresponsible to the point of being borderline sociopaths. My own research with accident-free individuals showed them to be more mature also, more conservative in their social attitudes and habits, to be more intellectual and thoughtful people (but not to have any higher IQ), to have a higher aspiration level, and to have had a happier and better adjusted childhood.

The large and consistent differences between these groups has led me to the belief that at least 90 per cent of all accidents are caused by the interplay between the basic personality of the driver and his driving environment. If this is true, any safety program designed according to these basic traits is pointing itself directly at the core of the problem instead of dissipating its engergy by trying to reach all drivers, accident-producing or not, and reaching them in terms of factors that

do not necessarily influence their accident-producing behavior. There is no logic in trying to impress a driver with the need for safe driving if he is already the type whose personality causes him to be cautious, conservative, and respectful of the rights and safety of others when he is behind the wheel. By the same token, there is no logic in spending time and money trying to impress a person with the need for respecting the driving rights of others if his personality dictates that he indulge in antisocial and asocial behavior. No straightforward plea to reason ever influenced the conduct, for example, of the confirmed and habitual criminal.

This line of reasoning dictates that in designing an attack we must first define the different personality groups that we are obligated to deal with and then devise special techniques for either influencing their behavior, or failing in that, to discriminate against them. In order to bring this subject as up to date as possible as to where this whole approach is leading us and in order to explore what its implications are I have devised a list of six groups which includes all drivers, and while theoretical in nature, is a list that I believe is entirely consistent with the experimental data now available. This is illustrated in Table I.

TABLE 1. Personality groups found among driving population, with expected driving behavior of each group and suggested method of treatment

Group	Type	Expected driving record	Program of treatment
1	Well adjusted; are upset only rarely by transient events and recover quickly	Almost never have an accident or incur a violation	Driver education based on pedagogic principles
2	Have emotional problems, but are socially responsible and are under rigid self-control	Almost never have an accident or incur a violation	Driver education based on both academic and psychotherapeutic technics
3	Socially responsible, but have emotional problems and are prone to upset for long periods of time	Will have periods of weeks or even months in which they are a poor accident and violation risk	Group psychotherapy with some driver education appended
4	Socially responsible, but have emotional problems and are prone to constant upset	Are rather poor accident and violation risks in spite of themselves	Group psychotherapy with some driver education appended
5	Have consistent tendencies to antisocial and a social behavior	Chronic violators who may also have a high accident rate	Prognosis extremely unfavorable; screen from group and limit driving privileges.
6	Miscellaneous (epileptics, diabetics, mental defectives, etc.)	Behavior unpredictable; driving record may range from very poor to very good	Each case highly individual as to diagnosis and treatment; in absence of knowledge of each case, screen and limit driving privileges

Group 1 consists of those individuals who routinely exhibit responsible, mature behavior. They respect the community and accept the responsibilities of citizenship. They are even-tempered and display anger and aggression only when appropriate. They are effective in their jobs and are capable of establishing warm and satisfying human relationships. They become upset and engage in inappropriate behavior only as a result of sudden and unusual happenings and quickly recover. They are excellent driving risks.

It is mostly members of this group that are reached by our present academic-type programs. They are capable of responding to an appeal to the intellect, but need to know by what rules they are expected to behave. This is especially true of our teenagers, many of whom are emotionally mature, but whom the adult population has failed by not having given them proper instruction. We know that, regardless of personality, such factors as years of driving experience play a significant role in accident production. Emotional maturity is correlated with age but is not necessarily dependent upon it.

Groups 2 through 5 suffer from emotional disorders characterized by inner struggles and discordant social relationships. Two essential features of such disorders are that they are precipitated by emotional stresses, conflicts, and frustrations and that they are most effectively treated by psychologic techniques. They are not produced by physical disorders and do not respond to routine medical attention.

Although often incapacitating and disturbing to the person and his associates, the symptoms of these persons are such that compulsory hospitalization or segregation is unnecessary. A few voluntarily seek hospital treatment, but the majority live at home and usually continue with their customary business and social activities. Symptoms are extremely varied. They may include anxiety, depressed spirits, inability to concentrate or make decisions, memory disturbances, heightened irritability, morbid doubts, irrational fears, insomnia, and inability to enjoy normal social relations.

Physical symptoms may include loss of control over some motor and sensory functions, shortness of breath, persistent irregularities, temperature imbalances, and all kinds of aches

and pains. About 5 to 10 per cent of the population exhibit such symptoms at any given time and as many as 20 per cent of the people have shown or will show such reactions at critical moments in their lives. About 8.5 per cent of the general population may show even more extreme symptoms, which could include destructive or assaultive tendencies, bizarre thinking, motor disorders, speech or memory defects, extreme alcoholism, et cetera.

The members of group 2 are of a special type. They are either very mild cases or have developed techniques for controlling the display of any inappropriate behavior. They often pay the penalty for such control by increased physical symptoms and are unable to derive any real satisfaction from human relationships, but they do manage to be very law-abiding, socially conforming, and cautious in everything they do (i. e., "Casper Milquetoast"). They too make excellent driving risks.

Group 3 members also have personal problems but have not been as able to control the outward expression of their symptoms as well as members of group 2. They are law-abiding and accept social responsibility, but their problems periodically get the best of them and for long periods of time they are unable to operate efficiently in their everyday living. During these periods they are likely to not see red lights, forget to observe routine cautions. This makes them prone to incur accidents and violations, but they are likely to have excellent driving records while not under the disturbing influence of their problems.

Group 4 members are almost constantly at the mercy of their problems. They may be basically law-abiding, conservative citizens, but may also constantly, and often unwittingly, engage in accident and violation-producing behavior. They make very poor driving risks. Groups 3 and 4 probably cause the majority of our highway accidents.

Group 5 are those individuals known as sociopaths, sometimes referred to as psychopathic deviates. They exhibit disorders of an antisocial or asocial nature. They are constantly at odds with the world. They resent discipline and refuse to conform to accepted ethical and moral standards. They are thoughtless of the welfare of others, are devoid of honor and

a sense of fair play, and experience no real remorse for their misdeeds. Their lives lack stability, direction, and tenacity of purpose. They change jobs frequently, and many lead a nomadic existence. They are generally described as cold, callous, shallow, cruel, infantile, and flighty in their moods. Many are ingratiating and have charming manners that enable them to make favorable impressions; some are aggressive and hard to get along with; others are weak, passive, and inadequate. Nearly all of them are selfish, stubborn, and egocentric.

About 1 per cent of the male population falls into this category. They are chronic traffic violators, and can be expected to have high accident records. They typically do not respond well even to intensive psychotherapy and cannot be expected to respond to less intense methods of education such as driver education or a modification thereof. There is some evidence that a large percentage of this group modify their behavior after the age of 35, especially if they have served a prison sentence.

Members of group 5 should be screened from the driving population and their driving severely limited, if not prohibited entirely. However, if such individuals do modify their behavior and become less of a threat on the highways after the age of 35 they deserve reconsideration at that time; perhaps a system of driving parole that would extend to these later years would be effective. Older individuals so screened from the driving population would have a much poorer prognosis and probably should be discriminated against for the rest of their driving lives. Laws prohibiting paroled convicts from driving a car have probably performed an unwitting service in the cause of highway safety and should be extended with that in mind.

Members of group 6 exhibit several types of conditions, including epilepsy, diabetes, mental deficiency, and a variety of physical conditions that are able, or potentially able, to produce unsafe driving behavior. However, they are all capable of falling into one of the other categories and must be treated individually.

About one out of 250 persons suffers from epilepsy. Obviously, these persons might make poor accident risks, al-

though the risk varies according to type of illness, the degree of success in controlling it medically, and the individual's personality type. The driving potential of each diabetic depends upon the type of his disorder, the nature and frequency of medication required to control his symptoms, and his type of personality. About one million of the population are mentally deficient. Whether or not a mental defective is a driving hazard depends upon the particular personality which provides the context for the condition. The driving behavior of any given defective may fall into any of the other groups. However, he would not necessarily be amenable to the same approach of education as the other groups and so must be treated as an individual case in both diagnosis and treatment. It is probably no mistake to allow a defective to drive if he exhibits a good driving record and/or shows himself to be socially responsible and able to follow the rules of the road. Many such individuals make excellent drivers.

Obviously, these six groupings overlap, and any given individual may well be placed in more than one category at any given time. However, they serve as guides and should permit the effective placement of each driver for purposes of treatment.

The treatment or educational program outlined in Table 1 is concerned primarily with the emotional makeup of the driver. An educational situation that is based upon good psychotherapeutic principles requires that each individual be given an opportunity to explore his own personality in a free and permissive fashion so that he can eventually reorganize his outlook on life to the point where his problems become less threatening and are less able to produce inefficient behavior.

The work would ordinarily be conducted in small groups and by professionally qualified personnel, a fact which is likely to be a big obstacle since such personnel are in short supply and practically none are presently engaged with the problem of highway accidents.

However, the basic principles of this approach can also be applied to the population at large by a well-conceived propaganda program. Such a program would have to be based mostly upon emotional values rather than intellectual. The

use of reason not only is limited in its effectiveness when used as a means of mass communication, but it promises to reach mostly those individuals who need it the least and who produce the fewest of our avoidable accidents (i. e., groups 1 and 2).

The so-called emotional techniques that I would advocate are available and very much in use today. Tons of soap are successfully sold to women who listen to daytime radio and television serials. These programs involve themselves less with plot than with problems that are close to the feelings of most American housewives. Among other things they deal with love, adventure, excitement, and many things either denied to or desired by the average housewife. Thus she becomes strongly identified with each serial and is emotionally "softened up" for the onslaught of the commercial in much the same fashion that a naval task force softens up an enemy beach before making an amphibious landing. The same techniques are used in selling to children, who, for example, are encouraged to identify with some TV hero and who watch avidly while that hero uses or advocates the sponsor's product.

Many years ago it was a common saying among politicians that "if you wave the flag and quote the Bible you can be elected to any office." Obviously, they recognized the value of the emotional approach in influencing behavior of the masses. The same principles have been applied in advertising, fund-raising campaigns, and other attempts to produce a specific pattern of behavior in the public.

Thus we have two approaches to bringing about changes in the driving behavior of the public. One is a personal contact procedure based upon psychotherapeutic principles of education, and the other is one of mass communication based on the emotions and feelings of the public. It is obvious that they should be used together in order to be most effective, and that any approach based upon persuasion by reason and logic alone must be considered to have minimal effectiveness.

The first method can best be used within limited groups, such as truck drivers, taxi drivers, and military units. This would involve the screening of the most likely candidates for such education already in the group, and the screening of

new applicants. Among the former, treatment need be applied only to those who hold the best promise of responding and who cannot be discharged or shifted to nondriving positions. Among the latter there would be no need for treatment since they would not be accepted into the group if it could be avoided.

The second method is not only applicable to the general public, but can also be tailored to suit particular segments of the population. Since it is possible to better know the personality characteristics of a delimited group, we can develop special forms of mass media (e.g., literature, conferences, safety campaigns, et cetera) that are better suited to the emotions and feelings of the subgroups they are designed to reach. In such a situation the two methods would be closely interwoven.

The techniques I have outlined must await further planning and additional research before their details can be worked out. However, I believe fully that we now know enough to justify such an approach and that the basic principles of application are already available and ready for use. Also, this philosophy must be applied to the very core of community living so that the attitudes of parents, teachers, politicians, the schools, churches, social organizations and other persons and groups who are charged with the development of character accept this problem in the same way they now fight against murder, theft, and other more obvious but no less harmful forms of man's inhumanity to man.

Now for the legal implications of what has been said. First of all it is apparent that you cannot legislate attitudes or personality. Law enforcement can hold the play of these factors within certain boundaries but it is within these very boundaries where 40,000 people a year are being killed and it is obvious that something else must be added.

One of the first tasks of the legal profession and its allied specialties, indeed for the whole population, is to stop regarding traffic violations as less serious than other criminal violations, and to stop thinking that violations are causes in themselves. If the driving world were to regard a traffic violation as serious a crime as stealing or committing assault then the full deterrent power of the law could begin to have effect; but

this is an impossible hope as long as our traffic courts and community leaders continue to behave as if such a violation were only a minor kind of "prank."

However, simply cracking down harder upon violators is not going to do the job alone—somehow the basic attitudinal and personality structure of the driver must be reached and influenced using the techniques I just described. Instead of merely passing and enforcing laws our legal professions must direct their energies and influences toward education and research. An example of what is meant is contained in what happened recently in a certain southern state. A clinic was established and staffed by psychologists and medical personnel. Whenever a state trooper or motor vehicle inspector encountered a person whose behavior did not impress as being conducive to safe driving he was referred to this clinic, where he was given a complete personality, neurological, and psychophysical study. The opinion and recommendations of this study were forwarded to the commissioner of motor vehicles who then decided whether or not the examinee's license should be revoked. For example, one person was referred by a state trooper when that person explained his speeding violation as being "desired by the voice of God"; another person was referred by a license examiner when, during his license test, he sweat profusely and had uncontrollable "shakes." Before the clinic was very old police and motor vehicle authorities were beginning to learn some of the more subtle behavioral signs that might indicate an "accident-prone" type of person. In the process they were also becoming educated and sensitive to the meaning of the real cause of accidents—personality. Thus, for the relatively small sum of less than $25,000 annually this southern state had initiated one of the most forward looking and intelligent programs in the entire country.

However, this fine beginning has a sad ending. Because of behind-the-scenes "politicking" and apparently the cross-purposes of selfish motives unrelated to any concern over highway safety, financial support for this clinic was withdrawn without notice after a few months and the project never renewed. This story illustrates both the good and bad influence that can be exerted by our legislative, judicial, and administrative specialists. Hopefully, someday enough people

from enough fields of specialization will unite to march in a common direction, using a common philosophy, in order to successfully attack a common problem.

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U. S. Naval Hospital
San Diego, California

TENTH ANNUAL MEETING

OF THE

AMERICAN ACADEMY OF FORENSIC SCIENCES

Will Be Held in Cleveland, Ohio
at the Hotel Carter

February 27, 28 and March 1, 1958

Section Meetings on:

Criminalistics
Immunology
Jurisprudence
Pathology
Psychiatry
Questioned Documents
Toxicology

Tentative Program in This Issue

Pathologic Patterns of Traffic Accidents

Richard Ford, M.D., Boston, Mass.

Usually the investigation of fatal traffic accidents is wholly concerned with mechanical failure or environmental factors with little thought of the nature of the human injuries and the interpretation of those injuries with respect to (1) the future care of the injured, (2) better engineering of vehicles for increased public safety, and (3) *the recognition of human physical failure as a precipitating cause of fatal accidents.* The same indictment may be brought in the case of aircraft fatal accidents. Equally true it is that no driver and no pilot killed during the operation of car or plane should go to his grave without careful autopsy and adequate toxicologic studies. Grossly unjust it is to the operator of plane, car or train to allow the pedestrian victim of the machine to be buried without similar competent studies. The blood alcohol of the individual who wanders into the idling or taxiing aircraft, who crosses the tracks too late, who staggers in front of an automobile on a stormy night, may well clear the man at the controls of a criminal charge of manslaughter and minimize a subsequent civil action demanding tens of thousands of dollars, or more. Equally important are anatomic findings of seriously debilitating disease in operator or victim: bilateral mature cataracts, advanced cerebral atrophy, cerebral hemorrhage, lobar pneumonia, myocardial infarction, and a host of others. It has been our experience in fatal traffic accidents that, except for children, the victim is usually "drunk," blind, mentally deteriorated, or all three, and the "most" common denominator is *stupidity* which cannot usually be diagnosed postmortem except by inference.

The pedestrian is sometimes referred to as "fair game." On the contrary, the pedestrian is usually unfair. The street is paid for by the driver, but the pedestrian invades at will with

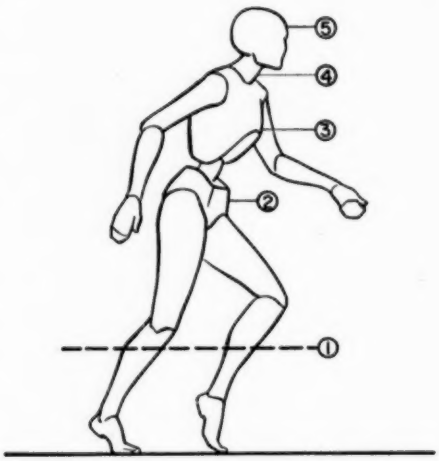
the fatuous attitude that the driver is alert and intelligent. He puts his life in the hands of a moron. In consequence result most of the 38,000 or more motor vehicle deaths yearly.

What are the stigmata of the pedestrian hit by motor vehicle, plane, or train? There may be none. A split skull results from propeller, truck body, diesel engine or lead pipe without evidence as to cause. Paint or grease upon the bone may help. The motor vehicle claims the lion's share of dead. At reckless speed the victim ends a sac of bulging, splintered bone. More commonly the pattern matches the impact sequence of slower moving vehicle (Figure 1). The bumper

Figure 1

SITES OF IMPACT SEQUENCES

PEDESTRIAN VICTIM



① BUMPER IMPACT

② GRILL OR FENDER IMPACT

③ HOOD IMPACT

④⑤ STREET OR WINDSHIELD IMPACT

being the leading edge strikes the victim first. If not alert and running fast he is hit from a lateral angle. One foot is up taking a step at the moment of total disaster. The other leg bearing his weight is very severely fractured. Both bones usually yield to the force but not at the point of contact. The

Fig. 2—Crushed skull of child who fell from tricycle beneath wheel of loaded oil truck. Tire tread contusions on face.

striding leg is always bruised and sometimes also abraded. Both legs show on the outer surface the direction from which they were hit. If, for example, force strikes from the left, the left leg shows a lateral lesion, and the right leg one that is medial.

The striding leg will have its impact closer to the heel. Lifted up off the ground, it is hit at a lower level. Caught flat-footed occasionally, the victim acquires tibial and fibular compound fractures bilaterally. Shins or calves are far less common impact sites than right or left approaches. Sometimes the victim "freezes" or tries to run away.

The second impact sequence site is centered at the hip. The pelvis comminutes against the grill or fender. The acetabulum is sometimes driven in. If thrown across the fender, the skull or neck may fracture on the ground or curb.

The third impact crushes the lateral thoracic cage and often in the aged breaks the osteoporotic arm.

The pedestrian, if flung aloft, is smashed against the windshield. Either hyperflexion of his neck and crush of spinal cord, or crack of skull against the glass or corner post may well ensue.

The child on foot or wheel or runners presents a problem. Tricycle, bicycle, sled or roller skate may thrust a head beneath a loaded truck which often leaves its trace (Figure 2). Not every child that goes to death should be thought to be simply heedless.

A nine year old on his way to school traversed a major highway. No traffic on the first half side, he walked in front of a trackless trolley. A massive tire tread imprint crossed his ruptured body (Figure 3). What need for further careful search? The vehicle did the "autopsy." Three years before, we later heard, he survived tuberculosis meningitis. His brain, examined, showed defects: tuberculoma impinging on one posterior cerebral artery and one entire occipital lobe in a state of total atrophy. He never saw the orange bus that split him wide apart (Figure 4). The driver had no warning that the boy was quite defective. His parents had not known it either but got surcease from learning that his brain was still infected.

At three a. m. a strolling man walked straight into a passing car. Flung to the ground, he later died from cerebral laceration. No alcohol, despite the hour; he was riddled with disease. Three years and more he suffered from pancreatic carcinoma. Studded over the peritoneum was carcinomatosis

Fig. 3—Ruptured chest and trans-abdominal tire tread. Run over by trackless trolley.

(Figure 5). Was this man's death an accident or planned for monetary gain?

The driver, dead, may yield no explanation of the crash for two divergent reasons: his body was not adequately studied or human error was to blame: misjudgment, fatigue, slow reflexes. The absence of demonstrable disease in the operator does not by any means eliminate a wanton act. Alcohol, barbiturate, antihistamine, tranquillizer, and a host of other

substances, some chemically undetectable, must be borne in mind.

On a six-lane divided highway, a driver slumped against the wheel; jumping the dividing strip, the car crashed head-

Fig. 4—Male genitals inverted when pelvis spread by weight of trackless trolley.

long against another. The driver's pockets bulged with hypertension medications; his heart's blood was high with secobarbital purchased on prescription.

In morning roaring traffic one car hit another and another and crashed into an open cellar hole. Quite dead, the driver!

Fig. 5—Carcinomatosis peritonei of pancreatic origin. Duration 3 years.

(Figure 6). Throat crushed by the wheel, he was asphyxiated. Other drivers saw his "struggle with the wheel." Full of sympathy, all imagined a defect in mechanism of steering. No! This man lived by the "principle" so common on the road: Hooray for me! To H— with you! For years he was an epileptic. His physician friend admitted seizing the steering wheel six months before to save a crash while the driver had a fit.

Sick at work, an adult male refused his friend's assistance. "I'll drive myself." He did, and killed a little girl and smashed

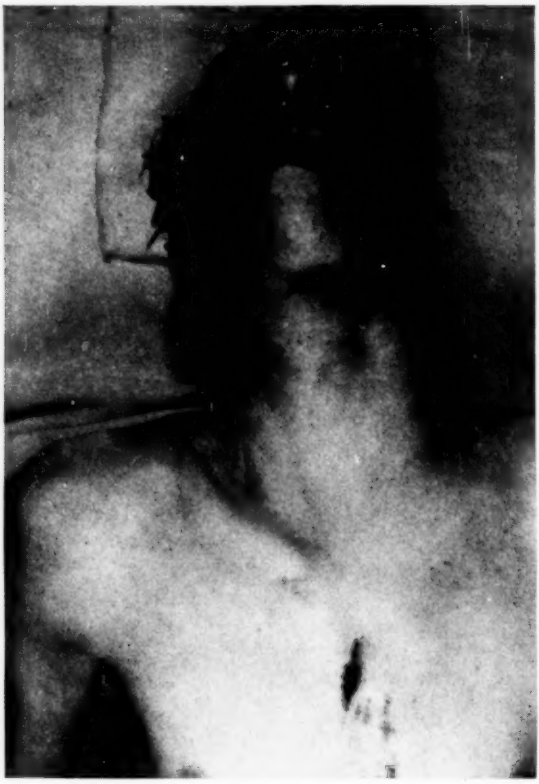


Fig. 6—Typical external injury pattern showing impact site of steering column on upper mid-chest and chin abrasions occurring as larynx strikes upper rim of steering wheel.

three other cars. Dead within two hours, he had no injury. A massive cerebral aneurysm two inches wide lay in classic site on the right middle cerebral artery at its first bifurcation lined with thrombotic laminae and ruptured into brain (Figure 7). Six years of "blackouts" this driver had endured and never once admitted on his license application "nervous or mental disease" (Figure 8).

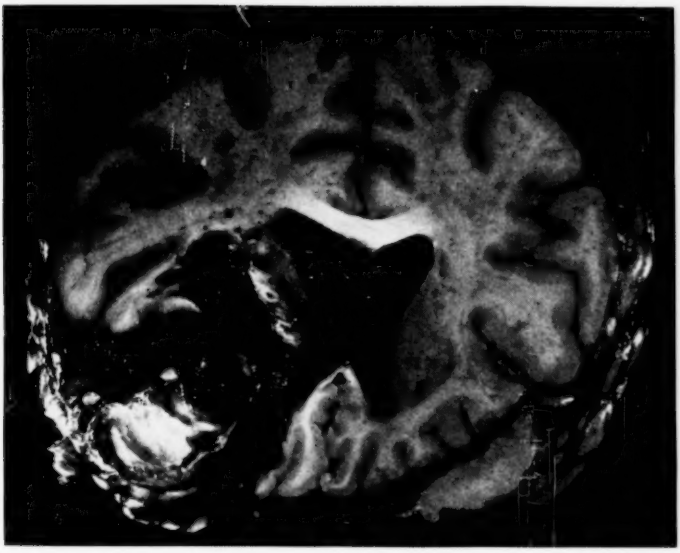


Fig. 7—Cross section through potato-sized congenital aneurysm lined with laminated thrombus ultimately rupturing into brain and lateral ventricles while operating motor vehicle.

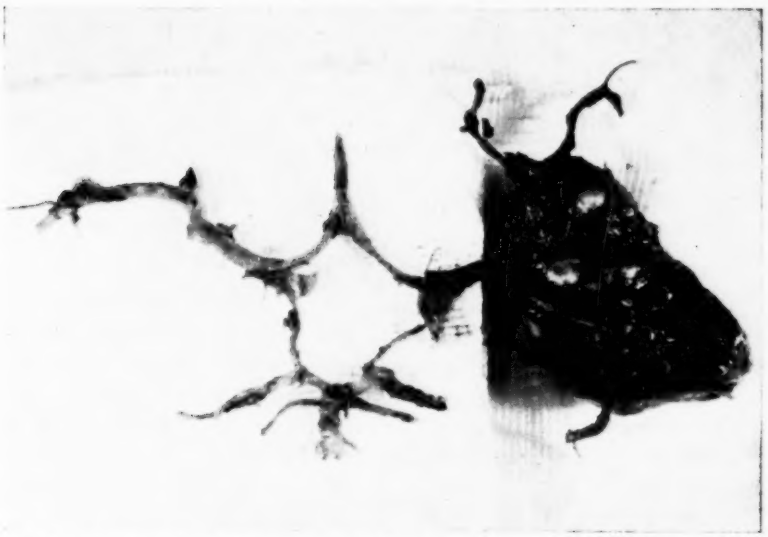


Fig. 8—The Circle of Willis dissected free together with the aneurysm which caused 6 years of intermittent syncope, concealed in license applications.

Cardiac failure in the driver is the most common cause of organic incapacitation. Angina, nausea, dyspnea, all can give the warning of the onset of attack. The car is pulled over to curb; the train stops by the "dead man's switch," the plane plows "through the middle of the house" or strews its load upon the ground.

What is the fate of driver when the car hits rock, pole or tree? He is flung against the steering post or saves himself

Fig. 9—Lacerated mesentery, source of hemoperitoneum. Abdomen explored surgically. Lesion not located because of ignorance of surgeon of patterns of injury due to steering wheel.

at lower speed with hands upon the rim. Three types of grave or fatal injury commonly result. The throat is crushed against the upper curve of wheel; the chest is crushed, both right and left, against the steering post; or belly drags beneath the wheel which rips the bowel loose (Figure 9). The impact to the larynx causes fractures, hemorrhage and edema ending in asphyxiation. The crush of chest compresses it, and diaphragm is torn (Figure 10), pericardium splits (Figure 11), myocardium is contused (Figure 12), and aorta even ruptures

(Figure 13). At higher speeds the injuries need hardly be depicted. If downward slides the driver's body at moment of impact, then lower rim of steering wheel acts like a human kick. The mesenteries often rip and bleeding may be massive

Fig. 10—Compression of chest with rupture of diaphram. Half of stomach in left pleural cavity.

(Figure 14), or compression of distended bowel can rupture muscularis. Days later such unfinished tears may end in peritonitis (Figure 15).

Beside the driver sits his wife, his child, or friend or doxy. When crashed into a telephone pole, the car may split wide

open. At slower rates the car may stop but front seat passengers cannot. A glass-hashed face (Figure 16), fractured skull, or crushed spinal cord inevitably result (Figures 17 and 18).

Fig. 11—Compression of chest. Ruptured pericardium supported by clamps. No cardiac injury.

In back seats, there is better hope of survival provided that the car involved is not equipped with rocket-launching platforms. On sudden crash, the two-door car with flopping seatbacks, propels its guests from rear to front and then straight through the windshield. The prospect of a gentle

landing cannot be predicted. A rigid back to the front seat is sometimes of advantage. The cautious rider, if alert, can throw himself against it. Provided that there is no "seat-failure" from defective anchor bolts, the rider loses his mo-

Fig. 12—Compression of chest with myocardial contusion on posterior of left ventricle. Apex of heart held up by clamp. Heart squeezed between sternum and spinal column.

mentum against the cushioned surface. If, however, through old age or simple inattention the rear seat rider fails to note the impending situation, he may be slammed with "iron hand" against the sturdy seatback. At twenty-one, a healthy man

was riding on a parkway. A passenger in a four-door car, he dozed in rear with total inattention. A sudden stop propelled him forward due to a slight collision. Few cuts, few

Fig. 13—Compression of chest resulting in typical transection of aorta near top of arch. Vector of force presumably transmitted upward by impact, ballooning the aortic arch and causing partial incomplete or total tearing of aortic wall.

scrapes, he reluctantly gave consent to overnight hospitalization. Three hours later, a startled nurse summoned the resident surgeon: no palpable pulse, blood pressure nil, cold and clammy with sweating. Three hours more he lasted with cause

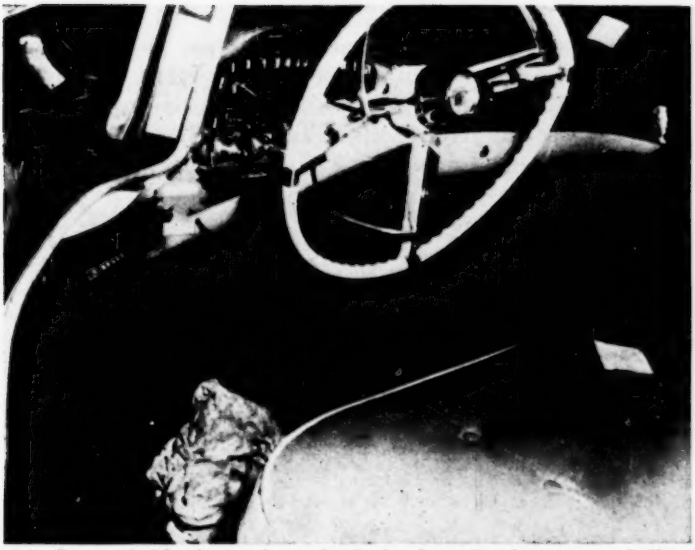


Fig. 14—Lower half of steering wheel rim bent by impact on belly wall. Figure 9 depicts the resultant mesenteric injury.

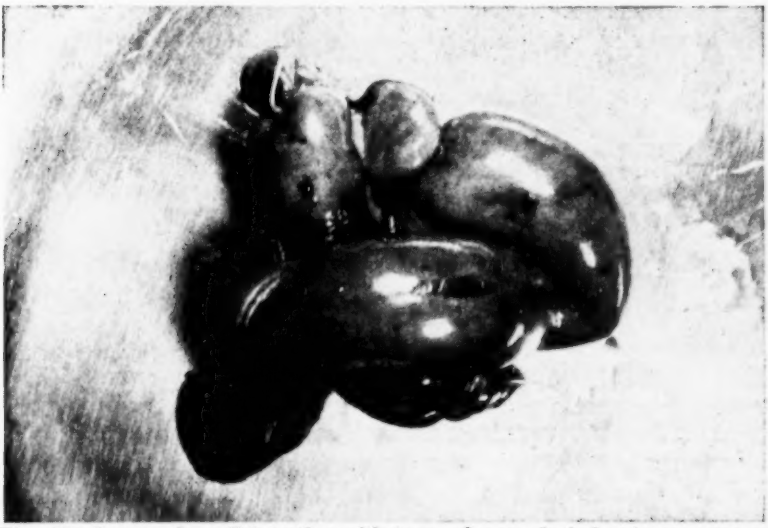


Fig. 15—Loops of small intestine with tears of muscularis leaving mucosa as sole layer intact. Subsequent rupture spills bowel content into peritoneal cavity.

for shock as yet to be determined. At postmortem there was found to be a ruptured descending aorta. Just below the arch it ripped from compression of the thorax (Figure 19). For the first three hours, reasoning backward, the adventitia held though muscularis parted. The last three hours ended with a blood-filled pleural cavity.

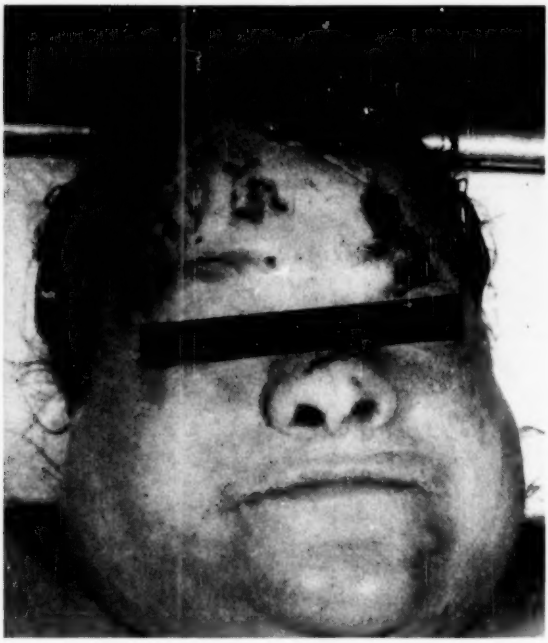
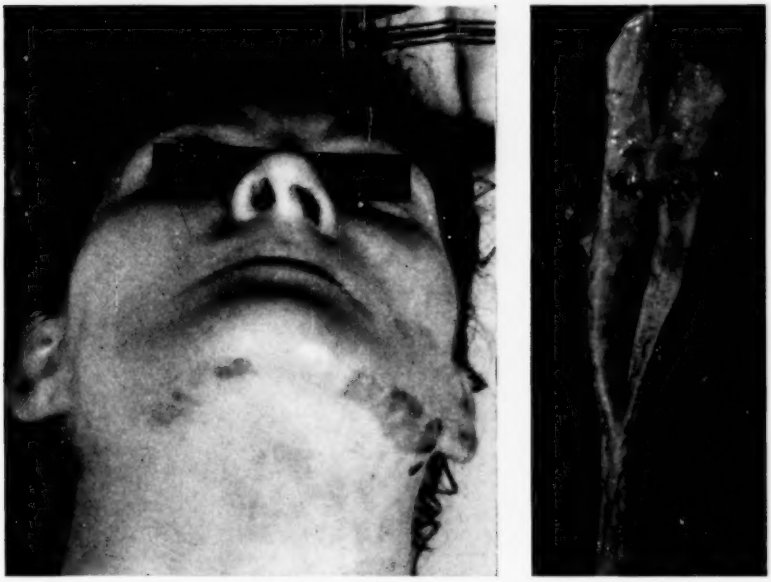


Fig. 16—Front seat passenger with safety glass cuts on forehead, nose and brows. Fatal head injury, incidental finding of cirrhosis of liver; driver survived. Slow-speed accident.

An aged woman, nauseated, soon began to vomit. The family doctor called to help gave palliative treatment. On another day he further urged cardiographic studies. The dowager was, on the fateful day, placed in the rear of a four-door car headed for the doctor's office. A minor collision at an intersection brought everybody out but the patient. She was dead. Autopsy showed neither fracture nor contusion.

Her pericardial sac held 450 ml. of blood (Figure 20). Cardiac tamponade resulted from the rupture of an anterior myocardial infarction of seven to ten days' duration. The damaged muscle at its weakest stage ruptured (Figure 21). Did the damaged muscle burst because of her excitement, or as with the young and healthy boy, with ruptured normal aorta, did it burst on impact against the rigid back of that front seat? On probability alone, impact was the cause. Alive before collision, she was dead immediately after.



Figs. 17 and 18. Front seat passenger. Sole external injury was rim of abrasion on under surface of mandible. Subluxation at C3-C4 caused immediate quadraplegia. Car struck utility pole at slow speed. Driver uninjured.

Driver, front and rear seat riders, all are victims of the car if momentum is obstructed. Most easily killed is he who leaves through a latch-sprung open door. For a penny pinched and a nickel saved thousands of men have died. On Hallowe'en a teen-age lad was riding with his girl. On a hard left turn the latch let go and her skull was split in two (Figure 22).

Not always is the problem simple, sometimes hard to solve. On a major street in uptown Boston, a girl lay dying in the road. Her clothes were rumpled but were covered with her

Fig. 19—Inattentive passenger behind rigid-backed front seat. Specimen viewed from above showing transsection near top of aortic arch. Six-hour survival. Presumably 3 hours of incomplete split of wall, followed by 3 hours of shock while mediastinal structures contained blood flow. Terminal rupture into left pleural cavity.

overcoat. Neurosurgeons could not save her. When last alert she was recognized in amorous embrace, parked at a curb with a man now missing, who later returned with legal coun-

sel. The Fifth Amendment cloaked the truth. The skull of the girl was split wide open. This was her only injury.

Not alone in active motion is the vehicle hazardous. Backed in a snowdrift at an intersection a cruiser held two officers.

Fig. 20—Hemopericardium following impact against back of rigid front seat. Aged, sick woman.

No answer to a radio call saved both men's brains and lives. A newly purchased motor vehicle still let fumes rise through the flooring when the tail-pipe was banked with snow. "Sex"

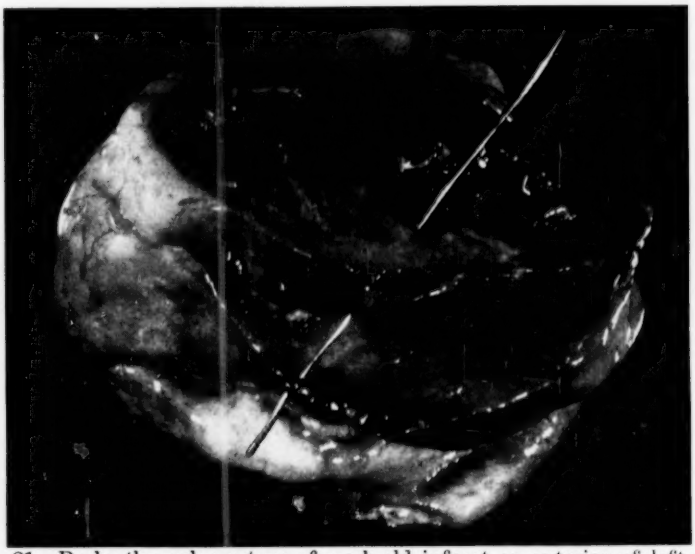


Fig. 21—Probe through rupture of week-old infarct on anterior of left ventricle and septum demonstrates source of hemopericardium in Figure 20. Rapid death of only injured person in minor accident.

Fig. 22—Saggital skull fracture. Front seat passenger. Hard left turn. Defective door catch.

and "auto" are frequently a cause of tragedy. The motor runs to warm the heater and pleasure ends in catastrophe (Figure 23).

Fig. 23—Winter scene in ranch wagon. Dalliance abruptly terminated by carbon monoxide when engine run for additional heat.

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What Is the Truth?

Lord Peter got up and paced the room. The light from the solitary reading-lamp threw his lean shadow, diffused and monstrously elongated, up to the ceiling. He walked over to a book-shelf, and the shadow shrank, blackened, settled down. He stretched his hand, and the hand's shadow flew with it, hovering over the gilded titles of the books and blotting them out one by one.

"Why?" repeated Wimsey. "Because I believe this is the case I have always been looking for. The case of cases. The murder without discernible means, or motive or clue. The norm. All these"—he swept his extended hand across the book-shelf, and the shadow outlined a vaster and more menacing gesture—"all these books on this side of the room are books about crimes. But they only deal with the abnormal crimes."

"What do you mean by abnormal crimes?"

"The failures. The crimes that have been found out. What proportion do you suppose they bear to the successful crimes —the ones we hear nothing about?"

"In this country," said Parker, rather stiffly, "we manage to trace and convict the majority of criminals—"

"My good man, I know that where a crime is known to have been committed, you people manage to catch the perpetrator in at least sixty per cent of the cases. But the moment a crime is even suspected, it falls, ipso facto, into the category of failures. After that, the thing is merely a question of greater or less efficiency on the part of the police. But how about the crimes which are never even suspected?"

Parker shrugged his shoulders.

"How can anybody answer that?"

"Well—one may guess. Read any newspaper to-day. Read the News of the World. Or, now that the Press has been

(Continued on page 72.)

Alcohol and Highway Fatalities*

*Henry C. Freimuth, Ph.D., Spencer R. Watts, B.S., and Russell S. Fisher, M.D.,** Baltimore, Maryland*

Numerous studies have been published throughout the years relating the effects of alcohol consumption on the driving ability of motorists. Such studies have been reported by Smith and Popham (1), Holcomb (2), Lucas et al. (3), Bjerver et al. (4) and Heise (5). The effect of alcohol on the pedestrian in traffic accidents has been reported by Gonzales and Gettler (6). The annual reports of the Department of Post Mortem Examiners of the State of Maryland have included information on the incidence of alcoholism in highway fatalities each year since 1949. However, with these exceptions, the literature is noticably lacking in any comprehensive study relating alcohol consumption to highway deaths. It is for this reason that the present study was undertaken.

In the routine work of the Medical Examiner's Office, it is our custom to obtain samples of brain, spinal fluid or blood from victims of highway casualties who die within twelve hours of their fatal injury. These samples are then analyzed for their alcohol content in order to determine what role, if any, alcohol consumption may have had in causing the deaths. We have compiled the data so obtained from 500 consecutive highway fatalities in the City of Baltimore. Only 79 of the total cases survived more than 3 hours, 45 more than six hours and 20 more than 9 hours after the fatal injury. These deaths occurred from January 1, 1951 through April, 1956.

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** The Office of the Chief Medical Examiner, State of Maryland and the Division of Legal Medicine, University of Maryland School of Medicine, Baltimore, Maryland.

TABLE I

ALCOHOL AND HIGHWAY FATALITIES IN BALTIMORE CITY
1951–1956

DRIVERS, WHITE
TOTAL CASES—131

ALCOHOL CONCENTRATION

Age Groups	Neg.	0.01% to 0.04%	0.05% to 0.14%	0.15% to 0.24%	0.25% to 0.39%
10–19	8	1	2	1	0
20–29	6	2	10	13	2
30–39	12	1	7	8	4
40–49	8	0	4	7	3
50–59	7	0	4	5	1
60–69	2	0	0	0	2
70–79	1	1	0	0	0
TOTALS	44	5	27	34	12

Of nine white female drivers, only one had alcohol in the range 0.15% to 0.24%. She was in the 30–39 age group. The remaining eight women had no alcohol.

TABLE Ia

ALCOHOL AND HIGHWAY FATALITIES IN BALTIMORE CITY
1951–1956

DRIVERS, COLORED
TOTAL CASES—25

ALCOHOL CONCENTRATION

Age Groups	Neg.	0.01% to 0.04%	0.05% to 0.14%	0.15% to 0.24%	0.25% to 0.39%
10–19	0	0	0	0	0
20–29	0	1	3	5	0
30–39	2	0	3	3	1
40–49	2	0	0	1	0
50–59	1	0	0	0	0
60–69	0	0	0	0	0
70–79	1	0	0	0	0
TOTALS	6	1	6	9	1

Among colored female drivers there are only two (2) cases. One (1) in the 10–19 age group, having a 0.15% to 0.24% concentration and one (1) in the 30–39 age group, having no alcohol.

The data on drivers are shown in Tables I and Ia. Of all the drivers tested, 58, or 37.2% of the total, had alcohol concentrations in excess of 0.15%. This is the concentration which is generally accepted as indicating that a subject having such a concentration should be considered to be "under the influence" of alcohol. One striking fact brought out by a study of the age break-down is that 39 of the 58 persons who were under the influence of alcohol or drunk were below the age of 40 while 22 of the total of 58 were below 30 years of age.

It is also interesting to note the comparatively low incidence of excessive alcohol consumption among the women drivers who were killed in comparison to the males. Only 2 of 11 females, or 18.1 per cent, were under the influence of alcohol in contrast to 56 out of 145 males, or 38.6 per cent.

If we add to the total number of drivers considered to be under the influence of alcohol those with alcohol concentrations in the range of 0.05% to 0.14%, we must consider an additional 33 individuals who possibly may have been affected by the alcohol which they consumed prior to death.

TABLE II

ALCOHOL AND HIGHWAY FATALITIES IN BALTIMORE CITY
1951–1956

PASSENGERS, WHITE
TOTAL CASES—100

Age Groups	ALCOHOL CONCENTRATION									
	Neg.		0.01% to 0.04%		0.05% to 0.14%		0.15% to 0.24%		0.25% to 0.39%	
	Male	*Fem.*	*Male*	*Fem.*	*Male*	*Fem.*	*Male*	*Fem.*	*Male*	*Fem.*
10–19	6	4	1	0	3	1	2	1	1	0
20–29	6	10	3	0	5	2	2	1	3	0
30–39	3	4	1	0	3	2	3	0	1	1
40–49	4	3	0	0	0	0	1	1	1	0
50–59	7	2	0	0	1	0	0	0	0	0
60–69	3	5	0	0	0	0	0	0	0	0
70–79	0	1	0	0	0	0	2	0	0	0
TOTALS	29	29	5	0	12	5	10	3	6	1

TABLE IIa

ALCOHOL AND HIGHWAY FATALITIES IN BALTIMORE CITY
1951–1956

PASSENGERS, COLORED
TOTAL CASES—37

Age Groups	ALCOHOL CONCENTRATION									
	Neg.		0.01% to 0.04%		0.05% to 0.14%		0.15% to 0.24%		0.25% to 0.39%	
	Male	*Fem.*	*Male*	*Fem.*	*Male*	*Fem.*	*Male*	*Fem.*	*Male*	*Fem.*
10–19	0	0	0	0	1	0	0	2	0	0
20–29	1	3	2	0	3	1	5	1	1	0
30–39	1	0	1	0	0	1	1	1	3	0
40–49	1	2	0	0	0	0	1	0	0	0
50–59	1	1	0	0	0	0	0	0	1	0
60–69	1	1	0	0	0	0	0	0	0	0
70–79	0	0	0	0	0	0	0	0	0	0
TOTALS	5	7	3	0	4	2	7	4	5	0

Tables II and IIa show the distribution of alcohol findings in passengers in motor vehicles who were killed in accidents. Of the 137 victims of such accidents, 36 or 26.3 per cent of the total were under the influence of alcohol or drunk with an additional 23 in the category in which they may possibly have been under the influence. Twenty nine of the 36 considered to be under the influence were below the age of forty while 19 were below 30 years of age. It is, of course, difficult to assess the significance of excessive alcohol consumption as a causative factor in motor vehicle passenger deaths. However, many of these persons undoubtedly reflect the condition of the driver of the vehicle in which they were being conveyed at the time of death. This is indicated by the fact that a number of these persons were killed in accidents in which their vehicle driver, also under the influence of alcohol, was likewise killed. It is also possible that an intoxicated passenger may offer sufficient distraction to a sober driver to cause the latter to have an accident in which the passenger is killed. This, it is true, is speculative and not subject to accurate estimation.

TABLE III

ALCOHOL AND HIGHWAY FATALITIES IN BALTIMORE CITY
1951–1956

PEDESTRIANS, WHITE
TOTAL CASES—151

ALCOHOL CONCENTRATION

Age Groups	Neg.		0.01% to 0.04%		0.05% to 0.14%		0.15% to 0.24%		0.25% to 0.39%	
	Male	*Fem.*	*Male*	*Fem.*	*Male*	*Fem.*	*Male*	*Fem.*	*Male*	*Fem.*
10–19	4	1	0	0	0	0	0	0	0	0
20–29	4	1	0	0	1	0	4	0	0	0
30–39	2	3	2	0	5	0	3	1	3	0
40–49	3	3	0	0	3	0	4	0	4	0
50–59	14	4	0	1	0	1	0	1	4	0
60–69	8	12	0	0	6	0	8	0	2	0
70–79	18	10	2	0	6	0	3	0	0	0
TOTALS	53	34	4	1	21	1	22	2	13	0

The data on the deaths of pedestrians caused by motor vehicles are shown in Tables III and IIIa. These lend added emphasis to the recently expressed observation (7) on the greater danger faced by the pedestrian in our larger cities than by the motorist, primarily due to misconduct on the part

of the former. In this connection, the statistics of the Medical Examiner's Office of Maryland show, for the period 1951 to 1955 inclusive, that 503 of a total of 964 motor vehicle fatalities in the City of Baltimore were pedestrians. This is 52 per cent of the total highway casualties!

TABLE IIIa

ALCOHOL AND HIGHWAY FATALITIES IN BALTIMORE CITY
1951–1956

PEDESTRIANS, COLORED
TOTAL CASES—56

ALCOHOL CONCENTRATION

Age Groups	Neg.		0.01% to 0.04%		0.05% to 0.14%		0.15% to 0.24%		0.25% to 0.39%		0.40% and up	
	Male	*Fem.*	*Male*	*Fem.*	*Male*	*Fem.*	*Male*	*Fem.*	*Male*	*Fem.*	*Male*	*Fem.*
10–19	1	0	0	0	1	0	0	0	0	0	0	0
20–29	0	0	1	0	0	0	1	0	0	0	0	0
30–39	0	1	0	0	0	0	3	0	4	0	0	0
40–49	3	1	1	0	0	1	6	0	2	0	1	0
50–59	3	2	0	0	2	1	5	0	2	0	0	0
60–69	2	1	1	0	0	0	1	0	2	0	0	0
70–79	5	2	0	0	0	0	0	0	0	0	0	0
TOTALS	14	7	3	0	3	2	16	0	10	0	1	0

Sixty-four of the 207 pedestrians, or 30.9% of those shown in Tables III and IIIa, were under the influence of alcohol or drunk. In addition, another 27 were in the zone of alcohol concentration in which they may have been under the influence. Only two women pedestrians were shown to be under the influence as compared to 62 males. This is in keeping with the general observation that it is relatively rare to see an intoxicated woman on our city streets but fairly common to see a man in this condition.

Another point worthy of comment is that forty-five of the 64 pedestrians who had "looked upon the grape when it was ripe" were above the age of 40 while 28 were above 50 years of age. This is a reversal of the picture seen in the drivers described above and is illustrated in Figure I. Here we have persons who have already had their reactions slowed as a result of advancing years and have simply heaped "coals of fire" upon their heads by excessive consumption of alcohol. Apparently, we must modify the slogan "If you drink, don't drive" to include the words "and don't walk, either."

Summary and Conclusions

A study of 500 motor vehicle fatalities in Baltimore City in which the victims died within 12 hours of their injury shows:

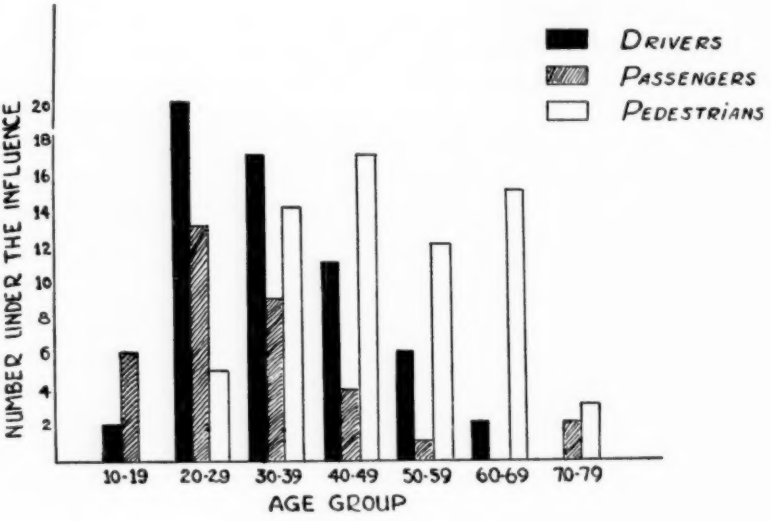

Figure I

(1) 58 or 37.2% of a total of 156 drivers killed in accidents were under the influence of alcohol or drunk at the time of death. An additional 33 drivers had sufficient alcohol in their tissues to indicate that they may have been adversely affected. 39, or 67%, of those under the influence were below the age of 40 with 22 under 30 years of age.

(2) 36 of 137 passengers, or 26.3%, were under the influence of alcohol or drunk with 23 more being possibly under the influence. 29, or 80.6%, of those under the influence were under 40 years of age and 19, or 52.8%, were below the age of 30.

(3) Of 207 pedestrians, 64 were under the influence of alcohol or drunk. This is 30.9% of the total. 27 other pedestrians may possibly have been under the influence. 45 of the 64 who were definitely affected were older than 40 years,

while 28 were above the age of 50. This is 70.3% and 43.7% respectively.

(4) Of the total of 500 cases, 158 persons were under the influence of alcohol or drunk with 83 more in the range where their alcohol consumption may be considered as probably being a contributory factor to the accident in which they lost their lives. The 241 cases listed represents 48.2% of the total 500 in which alcohol consumption may be deemed to be a causative factor.

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What Is the Truth? (Continued from page 64.)

muzzled, read the divorce court lists. Wouldn't they give you the idea that marriage is a failure? Isn't the sillier sort of journalism packed with articles to the same effect? And yet, looking round among the marriages you know of personally aren't the majority of them a success, in a hum-drum, undemonstrative sort of way? Only you don't hear of them. People don't bother to come into court and explain that they dodder along very comfortably on the whole, thank you. Similarly, if you read all the books on this shelf, you'd come to the conclusion that murder was a failure. But bless you, it's always the failures that make the noise. Successful murderers don't write to the papers about it. They don't even join in imbecile symposia to tell an inquisitive world 'What Murder means to me,' or 'How I became a Successful Poisoner.' Happy murderers, like happy wives, keep quiet tongues. And they probably bear just about the same proportion to the failures as the divorced couples do to the happily mated."

"Aren't you putting it rather high?"

"I don't know. Nor does anybody. That's the devil of it. But you ask any doctor, when you've got him in an unbuttoned, well-lubricated frame of mind, if he hasn't often had grisly suspicions which he could not and dared not take steps to verify. You see by our friend Carr what happens when one doctor is a trifle more courageous than the rest."

"Well, he couldn't prove anything."

"I know. But that doesn't mean there's nothing to be proved. Look at the scores of murders that have gone unproved and unsuspected till the fool of a murderer went too far and did something silly which blew up the whole show. Palmer, for instance. His wife and brother and mother-in-law and various illegitimate children, all peacefully put away—till he made the mistake of polishing Cook off in that spectacular manner. Look at George Joseph Smith. Nobody'd have though of bothering any more about those first two wives he drowned. It was only when he did it the third time that he aroused

(Continued on page 84.)

Miscellaneous Trace Evidence in Automobile Cases

Frank Stratton, B.S., Boston, Mass.

Trace evidence in automobile cases is, in fact, any physical phenomenon that may exist. The vital problem is to recognize significance when a particular physical entity is relevant evidence in a given case. In cases of personal injury, the very existence of the injury may blind an investigator so that he overlooks evidence which is unrelated to the victim's body. It is necessary to acquire the maximum amount of information from the scene, the car (or cars), and the body.

Several common types of trace evidence may be defined: structural damage, brushmarks, tire patterns, clothing, glass, paint, hair, tissue, blood, vegetation, etc., each of which is familiar to laymen. For the analyst, each type presents a progressive sequence from minimum to maximum information. Basic laboratory techniques will apply to several types of evidence. In most cases, trace evidence of several types will be found present, thus providing a basis for at least a practical estimate, if not a clear mathematical estimate, of the probability of identity. Rarely is the evidence limited to a single type, this occurring usually with a victim of small mass (child) and a vehicle moving at a slow speed.

A further problem is the evaluation of the evidence and the information derived from it. Each analytical technique has its limitations in both scientific and lay terms. The final arbiter is the jury which judges by *its* collective experience and knowledge; not by the analyst's.

Structural Damage

As an active participant in the accident, the car may carry all types of trace evidence. In a simple sense, the appearance and location of dents and other damage may yield significant

inferences. Damage caused by other cars, poles, buildings, etc., usually shows sharp angular dents, often with tearing, close to the point of impact, with gentler forms in more distant areas. Damage caused by striking a body is usually softer and far less extensive.

An experienced investigator is often "morally certain" that a given car has struck a body simply from study of the damage to the car. This sense is quite valuable since such points of damage indicate the best areas to search for trace evidence.

Brushmarks

Simple brushmarks without individuality have little meaning in many cases. However, in urban areas there are many instances in which one car may lightly touch or brush an individual, who then staggers or falls into or in front of a second car which may severely injure or kill the victim. Trace evidence on the body is usually from the second car, and the only evidence on the first car may be a mere brushmark in the dust. In these cases the significance of a simple brushmark cannot be overlooked.

Tire Patterns

Tire patterns and tire tracks may occur anywhere and on anything. In rural areas, or on unpaved roads or private property, they may be of great significance. On heavily travelled urban streets the most useful evidence is the "skid mark."

In all cases photographs should be made, including some with a rule so that scale enlargements can be made. When possible, casts may be made. With suspected cars, replicas can usually be made by driving the car over sheets of clean paper. It should be remembered that the load in a car can make slight differences in the dimensions of a given pattern.

Tire tracks in grass may be overlooked because the light or point of view is at an angle which minimizes contrast. Sights at various points or at different times of day may be advisable.

Clear patterns are often found on movable articles such as carton pieces, crate slats, paper, etc. The significance is closely related to the ease of being moved, time interval, etc. In many instances they can be associated with a fixed, but

less clear, tire track, and photographs showing this relationship are essential.

One should note that while the tread pattern is distinctive and first in mind, that the side pattern of the tire can also be significant evidence. These are apt to be less regular in many instances due to bunching or gathering of flexible loose material as in the case of body clothing.

Tread patterns may also be found on clothing. On light colored garments there may be a dirt pattern visible, while on dark garments there may be only pressure marks. With sufficient weight (as with a loaded heavy truck) the cloth may tear along the edges of the tread grooves.

Fig. 1—Tire pattern in both forms: dirt showing tread pattern and subcutaneous hemorrhage showing groove pattern.

On the body, tread patterns usually appear as reverse images, showing lines in red (subcutaneous hemorrhage) corresponding to the grooves in the tread. More rarely one finds a typical dirt pattern. Occasionally one encounters a case where both type patterns are present.

Figure 1 illustrates the occurrence of both patterns. The outline of the child's sun-suit is clearly visible. In this case three different witnesses described respectively, a passenger car, a light panel delivery truck, and a large van as the vehicle in question. The pattern and size established the large van as the offender.

In the comparison of tread patterns, close attention must be paid not only to size, but also to minor details, as a manufacturer may retain a basic design but modify it from year to year in minor ways.

Fig. 2—Marks from headlamp on a victim's coat. The cuts indicate a broken lens.

Clothing

Clothing is one of the most fruitful sources of evidence in automobile cases, although each case may be segregated according to the type of evidence found.

Simple dirt marks across the leg with so-called bumper fractures on the body may clear an innocent party, where there has been no disturbance of dirt on the bumper or front of car, and similarly the same notes (with possible pressure

marks) may show that a missing car is the culprit and foretell where evidence may be found on that car when located.

Prominent objects on the car with characteristic form may leave typical marks on the clothing. Figure 2 shows the outline of a headlamp on the victim's coat, the cuts present indicating a broken lens. Figure 3 shows the outline of an external hinge in a beret. Radiator ornaments, clamps or braces in the undercarriage, accessories, etc., can leave distinctive marks.

Fig. 3—Punched tab in a victim's beret, the outline corresponding to an external hinge on the car.

Conversely, the clothing can leave distinctive marks on the car, the simplest form being a series of parallel marks in the dust and dirt. These may be light, or with sufficient force of impact may be abraded through several layers of paint. The wale or ridge count may or may not be the same as the thread count. The cloth usually slides along the line of least resistance, which in most cases is the wale or ridge count. Figure 4 shows the mark of drill trousers on a rear fender. The heavy bright lines are where the wales rubbed through to a white

undercoat; the lighter lines surrounding show lesser surface damage.

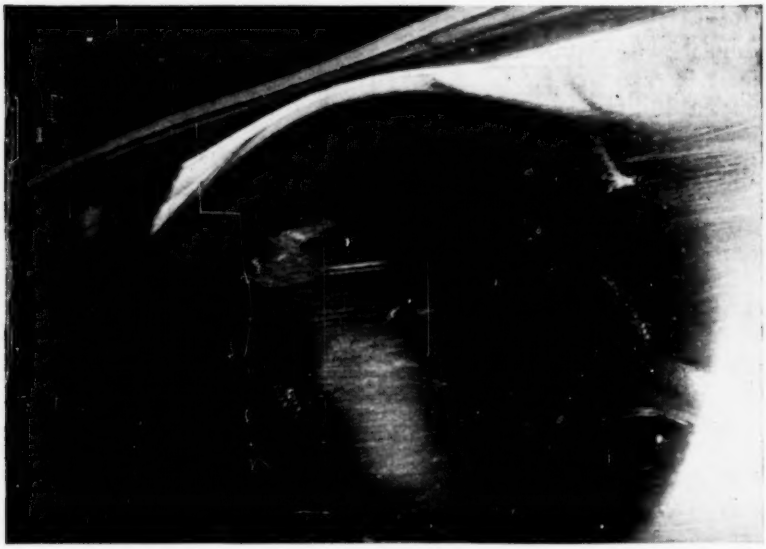

Fig. 4—Parallel marks in fender dent where wales (or ridges) of victims trousers have abraded the fender paint.

In cases of impact with cessation of body movement, one may find the print of actual weave pattern, sometimes with seams clearly visible imprinted on the dirt and dust of the car. These are often found in the accumulated dirt and grease of the undercarriage. Figure 5 shows such a print on a headlamp flange.

Fibers, threads, etc., may often be found on cars. The tenacity of such items is sometimes incredible and the problem is to prove identity with some object from the victim. Fibers may be identified microscopically, supplemented by chemical tests, etc. In some cases where a thread is available one may break down the percentage composition of the original thread in mixtures. Occasionally one encounters a small fragment of cloth which can be fitted to a hole in a garment for proof by "matched parts." Similarly, distinctive buttons may be

found on suspected cars, or accessories such as earrings or pocketbooks, etc., be found.

Apart from its own individuality, clothing often acts as a carrier for other types of evidence, such as dirt, glass, paint, etc.

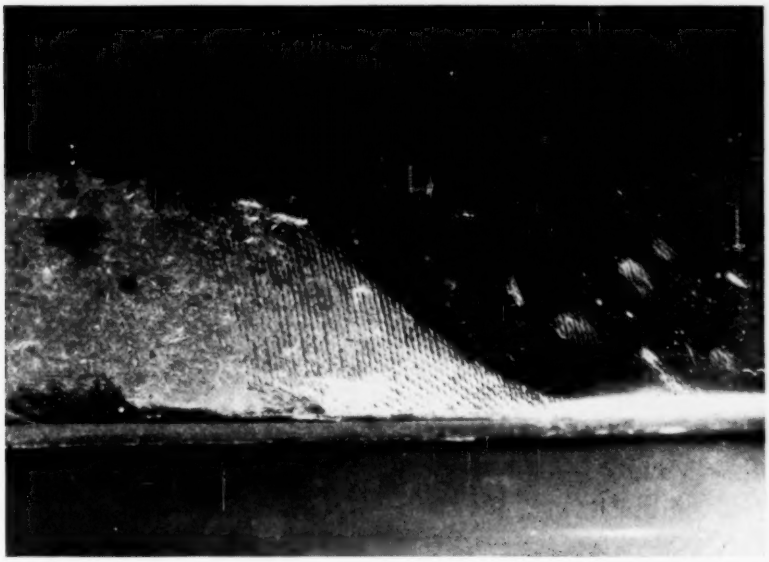

Fig. 5—Cloth pattern from victim's garment printed in dirt on a headlamp lens flange.

Glass

Glass is a common type of evidence, coming usually from headlamps, spotlights, or windows. Usually one starts sorting glass found in the street which may come from several sources, and secondarily one may find fragments of glass in the clothing.

Old-style lenses may have characteristic markings or pattern numbers which may indicate make and model of car. New-type units may carry crayoned stock numbers on the reflector backs.

Basic data for glass fragments are density and refractive index. Spectographic analysis or x-ray diffraction may add a

little more information. Color and fluorescence occasionally aid. Curvature may be estimated from geometrical theorems.

The ideal situation occurs when it is possible to fit a piece of glass from the car into a piece of glass from the scene or body.

Carelessness of mechanics may result in fragments of glass being carried in a headlamp for weeks after the accident. Figure 6 shows a small chip of headlamp glass (carried in the headlamp shell for 5 months) fitted to a fragment of lens found at the scene.

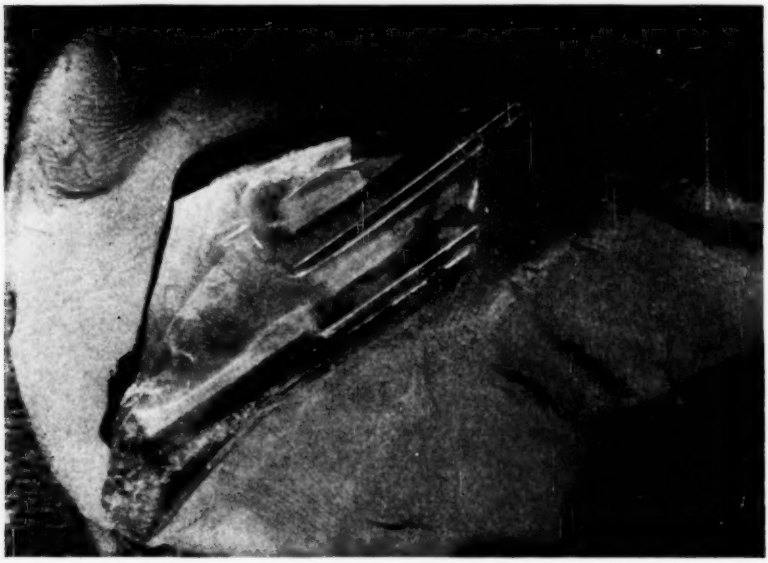

Fig. 6—Chip of lens from a headlamp shell fitted to a piece of lens found at the scene.

Paint

Paint, like glass, is often found on clothing, in the street, or in body lacerations. Analysis is essentially similar: density, spectrography, x-ray diffraction, etc. Of special significance is the number of layers of paint (color, dirt layers, thickness, sequence, etc.). Occasionally it may be possible to fit chips of paint from the body or scene into blank spaces on a car.

In most instances the paint specimen is apt to be a surface layer as abraded particles and not too distinctive. In other cases the paint may strip off in complete small pieces which may be readily compared. With sufficiently large pieces spectrophotometric standards of reflectance values may add additional information. Similarly one may have enough material to study the paint pigment and vehicle.

Color photographs are helpful, particularly in showing paint layers (photomicrographs), but the primary problem is to prepare and mount specimens so that a lay jury can inspect, see, and judge without visual or technical aids.

Figure 7 shows chips of paint on a topcoat, an abundance rarely encountered.

Fig. 7—Chips of paint on a victim's topcoat.

Vegetation

A less common item of evidence is vegetation, or plant particles, which may be found on a car and definitely associated with plant life at the scene. Bumper, axle, and crankcase,

etc. are the common areas. The material may be flower, leaf, stem, etc.

In most cases, the comparison is fairly obvious to a lay jury, but sometimes the likeness is more obscure, and recourse must be taken to the cytologic structure of the material. Here a botanist may be required as an expert or advisor, since plant anatomy is usually beyond the field of the police investigator.

Miscellaneous

This class consists of the "anything under the sun" material, and one must remember that all things are not what they seem. Figure 8 shows a small piece of heel leather removed from a radiator shell bolt which on a sub-zero day looked like a small chip of pine wood. Apparent frozen brain tissue has turned out to be breakfast banana forcibly regurgitated at the impact. In another case, a missing cotter pin left a wheel and axle bushing from a barrow mounted on a beer truck along the course of flight. Distinctive chrome decorations may fall

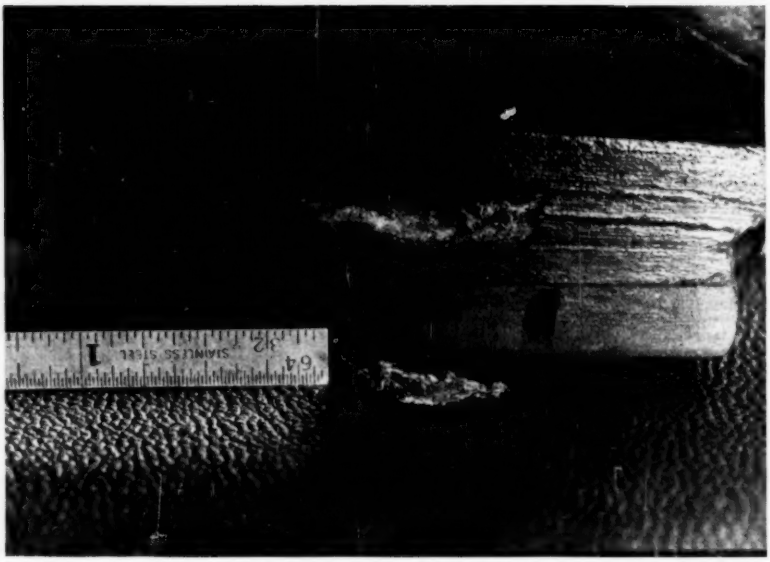

Fig. 8—Small piece of leather found on a radiator shell bolt compared to its origin, the heel of the victim's shoe.

off some distance from the scene. One defendant carried a victim to an outlying spot and left her, but forgot to take her umbrella from his car. A pet or pet hairs in a car may be significant when such an animal was noted by a witness. Similarly, outstanding printed cartons visible through a window can be significant evidence. Articles carried by the victim may leave their mark; such as kerosene, milk, lunch coffee, etc., coming from broken containers. Small articles may be carried off on the car. Briefly, according to the case, *ANYTHING* may be evidence.

Summary

The primary problem with trace evidence is the ability to recognize physical entities which can be significant evidence. Laboratory techniques are well-standardized for commonly occurring entities, and are described in technical journals and textbooks.

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What Is the Truth? (Continued from page 72.)

suspicion. Armstrong, too, is supposed to have got away with many more crimes than he was tried for—it was being clumsy over Martin and the chocolates that stirred up the hornets' nest in the end. Burke and Hare were convicted of murdering an old woman, and then brightly confessed that they'd put away sixteen people in two months and no one a penny the wiser."

"But they *were* caught."

"Because they were fools. If you murder someone in a brutal, messy way, or poison someone who has previously enjoyed rollicking health, or choose the very day after a will's been made in your favour to extinguish the testator, or go on killing everyone you meet till people begin to think you're first cousin to a upas tree, naturally you're found out in the end. But choose somebody old and ill, in circumstances where the benefit to yourself isn't too apparent, and use a sensible method that looks like natural death or accident, and don't repeat your effects too often, and you're safe. I swear all the heart-diseases and gastric enteritis and influenzas that get certified are not nature's unaided work. Murder's so easy, Charles, so damned easy—even without special training."

from ***Unnatural Death*** **(The Dawson Pedigree) by Dorothy L. Sayers, 1955 (2nd ed.) Harper and Brothers: New York**

Legal Aspects of Investigation and Prevention of Traffic Accidents

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The story of the various devices in common use in traffic law enforcement and prevention today reads like the science fiction of yesterday. The ancients conjured up romantic dreams of transmitting messages by supernatural intervention, without the use of human messengers. Today we all enjoy the marvels of television and radio, whereby we recline in our easy chairs at home and actually see and hear thoughts expressed and actions performed by persons thousands of miles away. We have ceased to marvel at such things. They are taken as an incident of our modern way of life; no longer gadgets which amaze us but actual necessities—"no home should be without one."

Yesterday the miracle of radar was in the wartime experimental stage, and the day before yesterday it was only a wild idea in somebody's imagination. Today it is in such common use that the courts say its principles are matter of common knowledge and judicial notice is taken of its accuracy and reliability as a device for measuring vehicle speed. No wires —no hoses across the road—no stop watches—no measurements as such, yet the "little black box"—the "Whammy" as they call it in North Carolina—can shoot out its invisible beam and register vehicle speed so exactly that people take it for granted and don't argue with it any more.

This, and other modern developments which the ancients would have attributed to the supernatural, are a part of our everyday life in this, the latter half of the 20th Century. The law has not been slow to utilize modern inventions and scientific devices as they become available for the detection, pursuit and conviction of criminals. The scientific equipment of

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the modern police station is a latter day marvel. Such things as moving pictures, in color, with sound, faithfully recording every detail of the taking of a confession or an interview with a suspected driver, are admittedly the ultimate form of convincing proof of what actually occurred. Such a reproduction, portraying the fumbling efforts of a drunken driver to walk and talk and his obvious lack of co-ordination, leave little room in the minds of jury for that elusive "reasonable doubt" about his actual condition, and the addition of the familiar chemical test for intoxication will establish, in well nigh conclusive fashion, the true *cause* of that condition.

Other equally commonplace "miracles" are the wonders of modern photography—pictures taken in the dark, or from the air, by means of cameras tripped by the force of light; the almost unbelievable advances in the use of chemistry to analyze various substances, including the amount of alcohol a person has in his blood; the principles of physics applied to black smears left on the pavement to determine the speed of the automobile whose screeching tires left it there. These and many other devices and techniques make up an imposing array of weapons in the modern armory of law enforcement agencies.

An investigating officer in this year 1957, equipped with the proper training and experience, can tell you quite accurately what happened in an automobile accident just by studying the tell-tale marks on the pavement and other indicia found at the scene. Experts who have become familiar with the science of momentum and force can tell, from examining damaged cars, or even by studying photographs of them, how the damage was inflicted, how the cars came together, the angle thereof, whether both were in motion at the time, and even the approximate speed of each (1). The ability to judge speed merely by studying the type and character of skid mark smears has become so common that even the courts are beginning to take judicial notice of so-called stopping distances. In fact the courts now recognize, as a matter of common knowledge, that the average reaction time—that interval of time from perception of danger to the application of the brake—is three-quarters of a second; an everyday application of combined principles of physics, physiology and psychology. Science has demonstrated the truth of these

principles to the point where reasonable doubt no longer exists.

Man has pierced deep into the secrets of nature to become master of the elements and put them to his practical use in enforcing the law, and this has been done by practical demonstration of scientific truths. We do not often stop to realize what a wealth of human experience, practical experimentation, scientific study and tireless effort have gone into the development of these everyday wonders. For instance, it arouses no special surprise to know that we use airplanes in traffic control. Earlier experiments in this field had shown their use to be entirely practical, if somewhat sensational. Airplanes are now used to spot areas of congestion, and communication with ground units is maintained by radio. The airborne observer directs action by the ground units in much the same manner as a military commander might dispose his forces when observing from a similar point of vantage. An even more ingenious use of airborne traffic officers is in clocking speeders from the air. In areas where the roads and highways follow section lines, the observer counts the section lines crossed by a speeding car within a certain number of seconds, gauged by a stop watch. In sectors where the intersection lines are not regular, but the road parallels a railroad track they use the *mile posts* in the literal sense. In places where there are neither mile posts nor section line roads, the patrol paints white stripes across the highway a mile apart—and there you are!

This same technique can be used in detecting stop sign violations, following too closely, failure to yield right of way, and so on. It is especially valuable in parts where the roads are winding or hilly, and passing violations most frequent and dangerous. By means of radio communication the air observer notifies members of ground units who apprehend the violator. The latter, needless to say, usually is astonished to learn that his driving was being observed—there was no patrol car or man in uniform on a motorcycle in his rear view mirror! That buzzing little airplane overhead, he thought, was only some amateur or rancher out for a ride in the sky. Planes used in this work bear no distinctive markings. One marked advantage of air patrol is that the airplane can

follow a speeder who is able to outrun a patrol car, and the observer can direct the mobile unit to the place where the car stops. Enforcement officials who have used these techniques say it is an effective aid in gaining driver compliance with traffic laws in rural areas, for they never can tell when they are being "tailed" by a "sky cop." (2)

So here is a modern, scientific method of traffic law enforcement that has proved successful through the use of gadgets borrowed from other fields. A police officer flies in the air, talks to men on the ground by means of waves which travel, unheard and unseen, through the ether. Orders are given, reports made in routine, commonplace fashion, all in the day's work.

What about our experience in getting the courts to accept evidence collected by these various scientific investigative techniques? With the single exception of the polygraph, or lie-detector device, the courts have shown a willingness to go along with progress. It must be remembered that, basically, the rules of evidence exclude that which is not known or shown to be generally accurate and reliable as proof. The law seeks constantly to discover the truth; it is concerned primarily with the production of facts. It is skeptical of evidence whose reliability is unknown or unproven, and as far as the rules of evidence are concerned there are no new or unique problems presented when scientific evidence of the kind under discussion is involved. We are long past the time when a vast array of mechanical, electrical and scientific devices must be carefully explained to the courts before evidence produced by them will be received. It must be remembered that watches, clocks, chronometers, barometers, thermometers, moving pictures, x-rays, scales for measuring weight, phonographs as recorders of sound, photographs as recorders of places and persons, wireless telegraphy and now even radio and television, have become matters of such common knowledge as to be accepted in court without foundational showing of their basic reliability, as a matter of course.

Nevertheless, as each modern development arrives upon the scene we find lawyers and judges expressing doubt and uncertainty concerning the admissibility of results produced by them. It is the rule that courts are expected to take

judicial notice of what every reasonably well informed person is supposed to know. (As one court expressed it, judges are not necessarily dumber than anybody else.) When the radar speedmeter was just making its appearance, about 1952, the Legal Department of the Traffic Institute was virtually flooded with requests for information and opinions as to the admissibility of such evidence. Some of the judges and many of the prosecutors were puzzled about "constitutionality"—that bogey-man which makes his appearance along with so many of our advances in law enforcement. As soon as some new scientific device reaches the stage where it becomes useful in crime detection and law enforcement, there he is—*objecting*. Some of our inquirers thought such evidence would be inadmissible in the absence of statute expressly permitting it. To these we felt tempted to answer: "Do you require a permissive statute in order to prove the time of day by showing what the hands on a clock dial show?" The same doubts and objections came forward in regard to the familiar chemical tests for intoxication.

Actually none of these things have presented any new questions of law or the application of long established rules of evidence. Reduced to its essence, the rule regarding all evidence is, and always has been, that in order to meet the primary test of *competency* the party offering such evidence has the burden of showing that it is generally trustworthy and reliable—that it can be depended upon to reflect the truth, which the law seeks so diligently to find. This burden applies to all kinds of evidence, scientific or not, and the proponent is not relieved of proving reliability until use of the particular device has become so commonplace and well understood as to be matter of common knowledge. We now look back over the years and centuries of human experience and watch the gradual emergence of gadgets in common use today without a thought as to their basic reliability.

Consider the timepiece, for example. It is a mechanical gadget, no doubt a fearful and wonderful contraption when it first made its appearance, resembling a fat turnip more than anything else. Imagine the skeptical attitude the courts must have taken when called upon to accept its readings as evidence of the time of day! Had proper experiments been

made to assure its accuracy as compared to that of the *sundial?* Had it been tested and compared with the well known and undoubted accuracy of the hour glass? The water clocks of the Egyptians and the Romans? All this seems quaint now, when everybody knows that watches and clocks are depended upon universally to give reasonably accurate indications of the passage of time. No doubt future lecturers will point to the hesitancy of our present day courts to recognize the dependability of the radar speedmeter, chemical tests for intoxication, and so on, as examples of that staid conservatism which traditionally characterizes the law. True enough, errors are possible; just as true, watches and clocks do not always agree, and mechanical defects may cause them to run fast or slow. But no court in A. D. 1957 would require an expert in the art of watch making to come and explain how watches work and that they are generally reliable for the purpose intended.

The earliest mechanical device for measuring vehicle speed was the stop watch, the result of which was accepted in evidence by an English court away back in 1906 (3). Ever since the automobile appeared we have been experimenting with ways and means of proving its speed. One of the first to be developed and accepted in an American court was a photographic device used in Boston in 1910. Operating upon perfectly sound principles of photography, this was a camera set to take successive shots of a passing vehicle at one-second intervals. Then, by measurement of the decreasing size of the object in the pictures during the one-second intervals, it was (and is) possible to calculate its speed with a high degree of accuracy. The Supreme Judicial Court of Massachusetts said, in sustaining the conviction of a bus driver caught by this device while in the act of driving over 10 m.p.h. in Boston: "In this case the result of the experiments did not depend upon the fluctuations of human agencies, nor on conditions whose relations to the result were uncertain, but upon the immutable workings of natural laws; and upon such evidence the presiding judge may well have found that such experiments were likely to be more reliable as to the speed of the automobile than the conjectural statement of an eyewitness or the interested statement of a chauffeur.

. . . *Indeed it would seem desirable to have some machine whose action being dependent upon the uniform working of the laws of nature would record the speed of a moving object.*" (4)

Prophetic words! The years subsequent to 1910 have brought us several such "machines." It is worthy of note that the principles of photographic science involved in the Boston case are implicit in the modern device known as the Photo-Traffic camera. Another interesting little device is the "Photo-Patrol"—a small camera mounted on a post beside the highway, set to expose on the electric eye principle. When this occurs the camera produces a picture of the vehicle, showing registration plates, etc. The camera can be set to expose when passing vehicles cut the beam in excess of predetermined speeds, and not otherwise.

In 1951 the Kentucky Court of Appeals decided a speeding case in which evidence was produced by one of the earlier measurement devices utilizing hoses across the road, with electronic connections to a reading dial in the nearby squad car. Witnesses testified regarding the principles of its operation, and it was shown to have been tested for accuracy by trial runs with squad cars prior to the incident in question. In sustaining the conviction the court said: "When it is shown that an instrument meets the tests of accuracy, its findings are accepted in evidence. We have long accepted the testimony of police officers based upon the calibrations of a speedometer as competent evidence, even though it is a matter of common knowledge that various degrees of friction, temperature or atmosphere, air pressure in the tires, and other factors affect the operation of the instrument to some extent." (5)

The Kentucky court here had reference to an early Washington case in which the reliability of evidence obtained by speedometer readings was challenged. The court held that the general reliability of speedometers was a matter of common knowledge, even though the factors mentioned might affect their readings. They *usually* give approximately correct rates of speed, and any factors of unreliability affect merely the weight of the evidence, not its admissibility. In

other words, it will be received for what it may be worth in the particular case (6).

Early cases involving radar evidence tended to avoid these principles, and much to-do was made about getting experts to prove that the device produced accurate readings. However, the first case to reach the hands of a court of last resort, the Dantonio case in New Jersey (1955), found that court prepared to say as a matter of law that the radar speedmeter was of known accuracy and reliability and there was no necessity of calling experts to establish that fact (7). In this respect the court recalled the story of fingerprint evidence, which had long been accepted in court without preliminary showing of its reliability. In so holding, the court had said: "In principle its admission as legal evidence is based upon the theory that the evolution in practical affairs of life, whereby the progressive and scientific tendencies of the age are manifest in every other department of human behavior, cannot be ignored in legal procedure, but the law in its efforts to enforce justice by demonstrating a fact in issue, will allow evidence of those scientific processes which are the work of educated and skillful men in their various departments and apply them to the demonstration of a fact, leaving the weight and effect . . . to the jury." (8)

An even more significant holding in the field of scientific speed checks was by the Supreme Court of Nebraska in March, 1956, to the effect that experimental tests alone are sufficient to establish the competency of such evidence. While the New Jersey decision applied only to the radar speedmeter, the Nebraska decision would cover *all* types of speed devices. If the experimental tests demonstrate accurate results they are admissible in evidence (9). This is good law, based on traditional theories regarding the admissibility of evidence. No statute or other authority is required to authorize its admission.

Not to prolong this discussion to undue lengths, the so-called Markel Camera (Abell camera) should be mentioned. By this clever device, mounted over the driver's head in a patrol car, candid camera shots are taken of the vehicle ahead, the resulting picture showing the speedometer reading on the patrol car, the time of day and the date, plus a view of

the rear of the other car, showing its color and design, license plate and outline of the driver. The Admiral Company recently announced a device incorporating the principles of radar, candid camera and a recording attachment into which the operator relates all the circumstances and data—as part of the *res gestae,* i. e., part of the event itself.

Something has been said (but much has been left unsaid) in this paper about skid marks. Evidence of speed deduced by this means is coming to be recognized as extraordinarily reliable proof of the minimum speed of the vehicle which laid them down. This type of evidence is based on simple principles of science and mathematics—reaction time, braking distance and stopping distances. Any teacher of mathematics can readily estimate the *coefficient of friction* relative to the different types of road surface involved, and from this the actual speed is easily determined by those trained in such work. Skid marks are merely streaks of rubber burned into the roadway by the friction of locked tires ground against the rough surface. It takes no great amount of scientific learning or experience to qualify one as an expert to judge minimum speed by such means.

No paper of this sort would be complete without mention of scientific methods of testing for intoxication. Somehow the advent of the motor car, and especially since it has mushroomed its way to top the list of our national problems, brought with it the peculiar menace of the intoxicated driver. The early stages of our experience in trying to discover effective methods of proof in such cases saw our law enforcement officers dependent upon the familiar performance tests. If the defendant staggered, spoke incoherently and had his clothing mussed up this was considered strong evidence of alcoholic impairment, since these symptoms usually accompany that condition. This was before medical science demonstrated that identical symptoms may indicate some 70 or more other pathological conditions in no way linked with alcohol. Medical science has proved, too, that any person whose chemical test shows a blood alcohol content of .15% or more is definitely under the influence of liquor to the extent that his ability to handle an automobile is appreciably impaired—he is a potentially dangerous driver.

Chemical tests for intoxication all determine the concentration of alcohol in the *blood,* even though the actual test may consist of an analysis of breath, urine or other body fluid. The actual rate of concentration is known to be substantially constant in all body fluids, including blood, and it is blood that carries the effect to the brain. We are coming close to the time when courts will begin to take judicial notice of the reliability of these tests, and then no longer will it be necessary to call in experts to prove that well-known fact, just as in the case of the speedometer, radar and countless other developments. Here science has demonstrated a means of aiding in the enforcement of laws against drunken driving by providing us with a sure-fire means of determining the *cause* of conditions whose symptoms may be identical with some disease or other ailment. These tests *protect* the innocent and *detect* the guilty. The legislatures of twenty-three states have now provided for the admission of such evidence, with presumptions as to its effect. We of the Legal Department of the Traffic Institute have collected every reported case involving chemical tests for intoxication (about two-hundred) since the first one in 1937, and not one of these has been reversed on the ground of unreliability of the tests. Failures of proof, as in other cases, account for such reversals as appear. When the tests have been properly conducted and the facts properly presented in court, they are admissible according to the well-known rules of evidence. As usual in such matters, these tests have had to run the familiar gauntlet of constitutional attack from various directions. Objections based on the search and seizure guaranty are held invalid since the right of search follows as an incident of a lawful arrest. Self-incrimination does not apply because that constitutional guaranty relates only to testimonial compulsion—disclosure by utterance—what a person may be compelled to say or write. It does not apply to physical evidence taken from or about—or even from inside—the body of the accused.

Gradually the law enforcement agencies add to their arsenal of weapons, and slowly—"with deliberate speed"—the courts come to recognize their validity and place their stamp of approval upon them. Courts follow cautiously in the wake of scientific progress, and perhaps this is well, for by the time

the courts get around to recognizing these things they are in the perfected state and the mistakes of the experimental stages are avoided.

Prevention of Traffic Accidents Through Driver Licensing

Perhaps it can be stated as a fact that the one development most significant for effective prevention of accidents within the automobile era has been that of driver licensing. L. S. Harris, Executive Director of the American Association of Motor Vehicle Administrators says: "It is generally agreed that an adequate driver license law properly administered and rigidly enforced is the most efficient and positive device available to public officials for traffic accident prevention. . . . The average driver considers no privilege more necessary to his everyday life and pursuit of happiness than the privilege of operating his automobile. Under proper enforcement there is no privilege which he will go to greater lengths to protect and preserve. . . . Records show that a very small percentage of drivers who have suffered one enforced suspension or revocation of license require similar treatment subsequently."

This attitude is well known to all traffic court judges and others engaged in the enforcement of traffic laws. The possibilities for screening out unfit drivers by denial of license, and for correcting driver attitudes by means of withdrawal of the privilege still have been only tentatively explored. There is a broad field for expansion of control activity in this field, despite the almost unbelievable progress made since the comparatively recent days when *anybody* could drive a motor vehicle, without let or hindrance from anyone. Now every state has its driver license law, ranging from the anemic South Dakota gesture to the really-strict requirements of Massachusetts and Connecticut.

Driver licensing offers an especially effective means of attack upon the traffic accident problem since it (1) keeps unfit drivers off the road and (2) removes those who prove themselves unqualified to enjoy the privilege of driving. This type of control is doubly effective because its legality is beyond question. Another important factor, too, is that this type of control is beyond the reach of local authorities: judges, police and prosecutors who might be subject to local

influences which would impair its efficiency. A driver license program is carried out on the state level, under the direction of administrators who can plan and put into operation a uniform system for the entire state, thus escaping the hit-or-miss patchwork effect of local programs.

The conditions, restrictions and requirements which can be attached to the privilege of driving are limited only by the requirement that they must be reasonable. Otherwise the resourcefulness and ingenuity of the driver licensing authorities have full play. This is due to the fact that driving on the highways *is* a privilege, as recognized by every court of last resort which has ever passed upon the question, 33 in number at the present time. Since the state, in the exercise of its police power, could restrict travel on the highways altogether if reasonably necessary, it may prescribe reasonable limitations and restrictions upon those who use the highways. No one has a constitutional right to drive an automobile, since it is a mere privilege, not property within the meaning of the various constitutional provisions. Thus the legislature may declare persons under certain ages ineligible to drive, in order to protect users of the highways from danger due to the inexperience and immaturity of such drivers. Eligibility may be restricted to those who can successfully pass the prescribed examination as to knowledge of traffic law and ability to drive an automobile properly. For the same purpose it may deny the privilege to persons with mental, physical or nervous handicaps which would render them a menace when driving a car on the highway. Many statutes now prohibit the issuance of a driver's license to those suffering from epilepsy, and to habitual drunkards and dope addicts (10).

As a means of effective control of drivers privileged to operate vehicles on the highways the driver's license is without equal. As Mr. Harris well says in the statement quoted above, it is the most effective means of driver control yet devised, for a driver may have little regard for money fines, or even a jail sentence, but is desperately intent upon retaining the privilege of driving. Driving today is far beyond the class of luxury—it is an absolute necessity to most of us. And the fact that it *is* a privilege, subject to withdrawal upon

violation of the conditions on which granted, is enough to keep drivers alert to their responsibilities in most cases. In fact it has been held by the courts that compliance with all traffic regulations is one of the conditions upon which the privilege is granted, and violation of traffic laws constitutes a breach of such condition. Thus, no constitutional issue impairs the effectiveness of the program, as long as the conditions are not arbitrary or unreasonable. This legal concept permits the imposition of tests and examinations in the first instance, preliminary to issuance of the license. Likewise it permits withdrawal of the driver's privilege when changed conditions indicate his unfitness, or conduct on his part showing him to be an unsafe driver. Within this area come the newly devised "point systems" by which the administrators are given a reliable means of keeping score on the driver's conduct.

This theory of privilege developed in the very earliest days of the automobile, and evolved from the cases of hit-and-run in which the defense was raised that laws requiring one to identify himself following an accident required self-incrimination. The court held either that no self-incrimination was involved or even if it was, he waived it when he accepted the privilege of driving. Now this theory of privilege has reached into a new area—that of chemical tests for intoxication. Confronted with the problem of obtaining test samples from unwilling drivers suspected of driving while under the influence of liquor, police administrators have been reluctant to employ actual force to compel submission, even though reasonable force is recognized as legal in such cases. The New York legislature, in 1953, passed a law providing that any person who operates a motor vehicle in that state "shall be deemed to have given his consent to a chemical test of his breath, blood, urine or saliva for the purpose of determining the alcoholic content of his blood" when requested by a police officer following an arrest. If the subject refuses, the test shall not be given, but "the commissioner shall revoke his license or permit to drive," etc. (11) Here is the perfect substitute for force in obtaining the desired result. The New York courts have held this a proper exercise of the police power, as attaching another reasonable condition to the driv-

ing privilege. The revocation of license is for failure to accept the test, and the license remains suspended even though the party may be acquitted on the charge of driving while intoxicated (12). Such laws have already been adopted in Kansas and Idaho (1955) and reports reaching our department indicate that at least half a dozen other state legislatures are considering similar legislation. Since no constitutional objection is available, there appears to be no reason why any state may not attach similar conditions to the issuance of a driving privilege. With the known reliability of chemical tests for intoxication, plus this effective means of obtaining them, it begins to look as though we have finally put our first team on the field against the drunken driver, who has terrorized the driving public since the beginning of the motor era.

The old trite saying that "Time does not stand still" is especially true in the field of traffic law enforcement. Human ingenuity and inventiveness, both in the development of scientific devices and in laws adapting them to our special use, have by no means been exhausted. We have only to look back upon the truly astonishing developments of the past two decades to realize that we can look into the future with confidence that even greater things are to come.

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Scientific Freedom*

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Those of us who have lived somewhat longer than the average age of persons still in active life have had a unique experience. "Unique" implies that it hasn't happened to anyone else, and that is precisely what I mean. We have shared in the life of two quite distinct civilizations. It is conjectural, of course; but I doubt whether ancient Egypt differed from Homer's Greece as markedly as the Victorian era differs from the atomic age.

Consider, for instance, the vast change in the status of women. It's a good place to begin this examination, for in many ways a civilization rises or sinks according to the place occupied by its women. We spanners of the ages came into a world in which women occupied a very peculiar place indeed. It was almost as if they were not women at all —almost as if they were completely desexed.

Sex and related matters were considered unfit topics for discussion. In extreme cases, marriage wasn't even marriage. Women consulted attorneys about the possibility of a contract which would provide that the male partner would make no attempt to consummate the marriage. In short, the tenor of the times, particularly as touching the relationship between the sexes, left women in a twilit zone of uncertain make-believe.

It was an odd state of affairs, the odder because so many rejoiced in it. If an actor plays the role of Napoleon on a stage, he is behaving quite normally. But if someone thinks he actually is Napoleon, he becomes a candidate for the

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booby hatch. Women in the Victorian era played a vague part somewhere between those two extremes. No one could tell where the play-acting stopped and the mental aberration began. No one could say what was pretense and what was prudery.

Though some vestiges of the pretenses and pruderies remain with us, the vast majority of women have renounced the sexless status. Gone are the numerous yards of dry goods with which woman once swathed herself from jaw to heels. She has put on a strip-tease of lordly proportions. Collars went, sleeves went, skirts were shortened and legs appeared: a long and gradual process, ending—I hope—with the Bikini.

But freeing the legs and arms has been the least of it. In the nineties she was still riding her pedestal as a being nobler in spirit, purer in mind and heart, infinitely finer in fiber than man. There was some hypocrisy about all this, no doubt, but there was also a genuine sincerity, which was even more painful.

It must have been hard on the Frances Willards who survived to see the girls climbing down from their exalted station and no longer behaving like ladies. But climb down they did. They learned to smoke, drink, cuss a bit, take their place with men in the business and professional worlds, and be far more companionable and desirable than ever they were in the earlier incarnation.

The literature and conversation of the nineties had the same air of fusty priggishness and unreality that the false position of women presented. William McKinley, president of the United States in 1901, faced an interviewer and a photographer. When the photographer prepared to take the picture, McKinley laid aside his cigar, with the comment, "We must not let the young men of this country see their President smoking." Richard Harding Davis had a cavalry trooper express his disgust by saying "Oh my goodness gracious me!" Every tale had to have a moral. It should teach something—something good and edifying. Literature existed for the purpose of forming the mind—i. e., perpetuating the current mores. The motif was that of Godey's Lady's Book.

Those fetters have been long since broken and we have moved to a frankness in literature that outfaces anything this side of Beowulf. Even the Elizabethans were out-and-out prudes by comparison.

But these are affairs of the mind and spirit. Consider the drastic change in tangible, more mundane matters. We have seen an incredible acceleration in locomotion. Some time just before the century's turn, an article was published in Munsey's Magazine, the burden of which was that the railroads could now sustain a speed of forty miles an hour, hour after hour. It was big news then, apparently. And why not? Only a life-time before, the fastest known means of getting about was the horse. To circle the world was a task of months, maybe years. Jules Verne had written a book about doing it in eighty days, but everybody knew that that was sheer fantasy. It can now be done in time measured by hours.

The houses we live in now, for the most part, have running water, hot and cold, in virtually unlimited amounts; they have refrigeration for the keeping of food; they have freezing units for all the ice a household normally requires; they have central heating, in many cases with automatic renewal of fuel supply. We need build no fires, carry out no ashes. These houses provide fuel for cooking our food at the touch of a button or a valve; they provide light or ventilation, or cooling, by the same means; they have provision for contact with the outside world, so that one may call for help or deliver a message thousands of miles away. The house I was born in had none of these things, not one. No home of that period had them all and the use of any of them was in its infancy. In the home, it is a new civilization.

Consider also how many things are commonplace to this age that were only dreamed of, at most, before Victoria died. Victoria knew the telegraph, but it can be doubted whether she ever used a telephone. She probably never saw motion pictures, certainly not those equipped with sound track. She never heard a radio. She never saw a television program. She never heard an airplane roar overhead. She may have seen an automobile, but probably never risked her life in one. She knew nothing of travel in the air or under the

ocean. On land and sea, in the cities and on the farm, in the workshop or on the playground, in the streets and in the fields, it is a new civilization.

And all this is merely fragmentary, merely the fringe of the vast change that has taken place. It says little of the advance in science and technology which has probably been greater in the last 75 years than in the immediately prior millenium. It says nothing of the forward march of medicine, of which the same could certainly be said—a span which has seen the development of aseptic surgery, the conquest of many infectious diseases, the discovery of insulin, of penicillin and the antibiotics, the development of unbelievable surgical techniques, to mention a mere handful of the many advances made.

There has been a vast change, too, in the social structure. There has come about a distribution of wealth and well-being that has closed much of the gap between rich and poor. Common labor has been to a large extent replaced by mechanical devices, the operation of which has called for skills, well-paid, sometimes highly paid. We have learned that a wider saturation of the means of good living makes in general for prosperity. We are producing more and consuming more than could have been thought even remotely possible in that other civilization. Woodrow Wilson, then president of Princeton, is quoted as saying "Nothing has spread socialistic feeling in this country more than the automobile." He regarded it as a "picture of the arrogance of wealth." This was in 1906. In 1957, we shall manufacture some six or seven million *more* cars and they are a symbol of the democracy not of the arrogance of wealth.

One could go on with these sketchy contrasts beyond the limit of endurance. Books could be written about the change and at least one has. Surely enough has been said, however, to support the thesis that we have witnessed nothing short of a revolution. Has there been progress? That isn't a question really; I'm merely announcing a subject for debate.

We have freed ourselves from many silly and really vicious taboos, and certainly that is a gain. Our social intermingling is on a broader, freer base, and our petty hypocrisies are

fewer. But are our lives and mentalities any richer and fuller?

Our armamentarium of facts is better beyond all compare in this our present age. Has our armamentarium of wisdom increased proportionately? Are we any better able, in that sterling Pauline phrase, now than we were then "to approve the things that are excellent?"

We have gained immeasurably in speed, our pace is faster, we live more intensely. Perhaps there's too much tension indeed, too much speed. Our mental hospitals are full to overflowing and our delinquencies and deviations begin almost in infancy. The new democracy of wealth has not yet been leavened by the balancing sense of *noblesse oblige.* So our society is less urbane; we observe the phenomenon of pressure groups, determined and pugnacious; we dwell with a pervading belligerence that at best presents bad manners and at worst social conflicts and criminal activities. We have gained a Donnybrook hilarity and lost a serene tranquility. This is not a secure age. That other civilization was much safer.

Not that I should advocate a turning back of the clock, even if that were possible. One thing is very sure. If the Victorian era could be described as static, and I think that would be fair, our present time is dynamic. It will not level off at any given point. Every new advance in science opens vistas of a dozen more. Our times are on the jump and we must jump with them, indeed try to keep one jump ahead. We have no choice. There are dangers ahead and we must try to plan what we are to do to mitigate them. To mention just one item: our exploding population is every bit as serious a threat as the possibility of atomic warfare.

Maybe we've advanced too far in too short a time. It is something like the quick growth of a small retail shop into a nation-wide chain of department stores. The proprietor of the small shop can run the business easily, all by himself—it's all under his own hat. He takes each day's problems as they come. But the chain can't be run that way. Elaborate machinery must be set up. Complicated peering into the future is a requisite. The planning and thinking must be of

a high order. A wholly different set of brains is required. If there is any merit at all in that simile, then I am really horrified. For I'm not at all sure that we the people have the necessary capacity to handle our situation. There are plenty of grounds for such misgiving.

We have shown ourselves inept, not once but many times, in detecting what is and is not significant in our environment. Phillip Guedalla tells the tale of one who came to Pontius Pilate when Pilate was an aged man to ask "Was not Jesus of Nazareth crucified while you were procurator of Palestine?" "Jesus?" replied the old man, "Jesus of Nazareth? . . . I don't remember."

One of the truly great classics of English literature was not intended by its author for publication nor was it published for some time after his death, and then by a couple of personal friends who caused publication of "these trifles" as a memorial to a good fellow who deserved one more whack at the public eye before he went out of mind altogether. Just a little personal tribute, to a man who certainly would never have a larger one. The reference is, of course, to the plays of Mr. Shakespeare.

Literature isn't the only field in which this has happened. A scientific investigator made a discovery of exceptional theoretical and practical importance. He reported his research briefly in a scientific journal of his day. The report created no stir and the investigator himself seems to have joined the conspiracy of silence. Thirty years later, after the investigator was dead, his paper was stumbled upon and became the basis of modern genetic theory. The investigator, as you are aware, was Gregor Mendel.

A member of the English government, eager to join companions for a long week-end in the country, decided it wasn't necessary to wait in order to sign an official paper that was being prepared. When he returned the following week, other more pressing matters demanded his attention so the paper—an order to an English officer—was never sent. Even after it became apparent to all concerned, including the officer, that the order should have been sent, even after everyone learned what the order was, nothing was done about it. This may be the most extraordinary example of the dilatory on

record, and it seems like it with the perspective of the years; but a more understandable interpretation of the affair is that no one concerned deemed the order to be of much importance anyhow. The statesman was Lord George Germain; the officer who should have received the order was General Howe; the order was to march north and join General Burgoyne; the result of its not being sent was the surrender of Burgoyne at Saratoga and the establishment of the United States of America.

Two young bicycle repairmen, after many years of experiment and study, finally brought about a certain result. They were much elated over this success and, the season being close to the holidays, decided to break off their efforts and go home for Christmas. They telegraphed this news to their sister in a town some miles away. The sister was equally excited. She knew the editor of the local paper and telephoned to him at his office where he was relaxing at a game of poker. She told him what had happened and added, "And the boys are coming home for Christmas." "Thanks a lot," said the editor, "I'll announce that the boys'll be home for Christmas." That was the newspaper world's first reaction to the achievement of the Wright Brothers at Kitty Hawk on a bleak December day in 1903, when they got the first heavier-than-air machine into briefly sustained flight and raised the banner of a major industry that has altered the ways and lives of us all. Moreover it was in 1908, four and a half years later, before the press in general woke up to what the Wrights were doing and sent experienced reporters to observe them. News hawks?

These examples are spoken merely from poking around in the debris of a disorderly mind with the wobbly stick of an uncertain memory. To contemplate what patient and competent research might uncover is appalling. Every case in which the significance of a present event was at once recognized must be matched by a dozen, a score, a hundred, in which it wasn't. Too, too often we don't know the proverbial beans when the proverbial bag is opened.

We are no better at prediction than we are at interpretation. In 1848 when Victor Hugo was made Commissioner of Public Instruction for the new republic after the abdication of Louis

Phillippe, he loosed some extremely purple prose about the end of ignorance, social injustice, man's inhumanity to man, poverty, crime, and other evils, all of which were to melt away before the power of compulsory education. We've had compulsory education for many a long year but it has never lived up to Hugo's prospectus.

In 1920 we flocked to the polls in response to Mr. Harding's appeal to "return to normalcy." We actually thought we could. The divine right of kings was all that had stood between us and long centuries of unbroken peace; and that right had been cancelled on the muddy, bloody fields of Flanders and France. One need hardly say that we seem further away than ever from a tranquil world; and that democracy is in peril, even in its own houses, needs no descant.

Woman suffrage was to purify politics and take it out of the hands of creeps, heelers, and bosses. Does anyone now believe it has made a ripple of difference, except to give us more votes to count at greater cost?

I have forgot what Elysian field the direct election of United States Senators was to lead us to, but it was something sweeter, bullier, and more elegant than what we had. Would anyone go out on a limb and say that the stature of senators has been notably greater since then?

Prohibition was to result immediately in a generation which "wouldn't know the taste of alcohol." No prediction in the social arena came off quite as badly as that one. But so many have failed of success that I return to the notion that, though we are obliged to do some long-range planning, I can have little confidence about moving in the right direction, if we proceed as we have in the past.

It seems to me that two lines of approach are open to us: what may be called the philosophical and what may be called the factual. In the past, we have chiefly chosen the philosophical. That would be the natural approach for the political big-wigs, the reformers, the theorists, the starry-eyed. Often, usually perhaps, the philosophical approach is also doctrinaire. Hitler had his credo with many curious articles of faith. So of course has the communist world. So have most of our own factions in a democracy. The party-line, or the

party, or the code of the group becomes more important, presently, than the ostensible aims.

I should like to see the factual approach take over. That would be a scientific approach. Obviously the scientist has contributed much to our present society. Indeed no good and worthwhile element in it has been brought about without the aid of science. But what I have in mind is something quite unlike specific attacks on particular scientific problems. I should like to see a positive effort made in social criticism by scientists—not of the social or historical sciences, but of the exact sciences. I should like to bring to bear on this social critique the same cool objectivity, the same criteria, the same methodology, the same disregard of credos and theories that obtain in the laboratory.

In the Operations Research Office, I am told, teams are appointed to study given problems or perform given tasks. Is it an idle dream, to imagine a world-wide team, drawn from many nations, set to find, for instance, a formula for world peace? The persons of this team would not consist of Americans, or French, or Russians, or any other national, racial, or economic group. They would meet and work as scientists; think as scientists, not as partisans, reach a conclusion as scientists, not as advocates. I believe such a team could come up with a solution even to as large a problem as world peace.

The difficulty of course is that a strictly scientific solution would be unacceptable to many. I can't imagine the communist, for instance, giving up the idea of world conquest, because that's a main plank in the party platform, and Karl Marx put it there more than a hundred years ago. It would be useless, I fear, to point out that the world may have changed in a hundred years.

Does that put the finger on something—that conflict between fact-finding and party line? I have a notion it does. In 1918, amid great rejoicing, we finished a war to end all wars, to make the world safe for democracy. Since then we have had to defend democracy against the dictators and now against the Marxist will to ruin. Three great battles: democracy against divine right of kings, democracy against

Hitler and Mussolini, and democracy against communism.

Yet this is merely descriptive of the symptoms. The real issue is age-old and age-long. Men have fought it out long before any one of us was born, and the struggle will continue after all our tongues are silent. It is the issue between freedom and enslavement. We face other problems and dangers to be sure. We are certain to be defeated by them unless we not only retain the freedom we have but gain new freedom. I'm not thinking solely about political freedom or economic freedom. There is a more important freedom than any of those mentioned in Mr. Roosevelt's famous four. It is the freedom to think. What good is freedom of speech without freedom to think? In this, science is the freest way of life I know of. It is free to think. It can entertain new ideas and concepts as no other way of life can. The politician must ask what the effect of a new concept will be on his party and on his political fortunes. The chauvinist must ask what the effect will be on his nation or race. The sectarian must ask whether the concept is truly orthodox, whether it falls within the tenets of his sect. The scientist asks only if it is true or if it shows promise as a working hypothesis.

That is why I believe that science is our best hope for the future. But there is no hope at all unless science stays free to follow wherever honest investigation leads. These remarks will be abridged in five seconds. The freedom of science must never be abridged.

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Quantitative Spectrographic Analysis in Criminalistics

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Role of the Spectrograph in a Criminological Laboratory

It is a well-accepted fact that problems of comparison of minute inorganic samples (e. g., paint flakes, splinters of glass, certain types of safe-lining materials, metallic fragments, etc.) are best solved by means of spectrographic procedures of analysis; these give best information about the chemical constitution of a material and certainly satisfy the requirement that the best available evidence must be presented to the courts.

Other general applications of the spectrograph are of great value to the analyst in a criminological laboratory; e. g., controls of chemical determinations, guide to chemical analysis, rapid qualitative examinations of materials and analysis of tissues for metallic poisons.

At the Laboratory of the Attorney-General of Ontario, thirty-eight court cases required spectrographic analysis in 1955—of these, six were comparisons of glass, seven comparisons of safe linings, eight qualitative examinations of metals, thirteen analyses of paint and four quantitative analyses of metals. Most of these cases were: breaking and entering, safecracking, and motor vehicle accidents. Quite often the accused, faced with the laboratory findings, pleaded guilty.

Some Typical Spectrographic Cases (1955)

1. A goldsmith shop was broken into and a quantity of gold filings were stolen. An examination of the clothing and

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of the fingernails of a suspect revealed several microscopic fragments of a yellow metal. A spectrographic examination of the individual fragments indicated they were gold alloys, of varying composition, consistent with having come from various gold alloy objects, as was the case of the goldsmith's filings.

2. Copper cable was stolen from a railway. Some copper cable was found in possession of a suspect. A spectroanalysis showed that the cable found in possession of the suspect was of two types: One type was coated with very pure tin, the other type was coated with a tin-lead alloy. The same occurrence was found in the cables in possession of the railway. Knowing the laboratory findings, the accused pleaded guilty.

3. Charred bones were recovered from a burned house. The possibility of criminal action was investigated: An X-ray fluoroscopic examination showed the presence of small particles, which looked very much like lead shot. A spectroanalysis of these small particles showed they were made of lead-tin 50–50, which is the most common type of solder, and a reasonable explanation for its presence among the bones could be that they came from some soldered joint.

These examples alone should prove that the spectrograph is more essential than useful in a criminological laboratory.

Spectrographic Procedures

In some of the above-mentioned applications—rapid examinations, guide to chemical analysis, etc.—a qualitative analysis of the spectral region 2400 A° to 4000 A° is generally sufficient. Direct current arc excitation, with electrodes adapted to the particular case, is almost always employed for the purpose.

When the problem is to compare two samples and express an opinion about their identity, a qualitative or semi-quantitative analysis is not satisfactory, because materials of the same type of chemical composition give the same type of spectrum, and that can lead to erroneous conclusions unless quantitative procedures are applied.

Quantitative analysis is based on the comparison of unknown samples with a series of standards having the same type of composition. This requirement of the standards does

not cause difficulties in metallurgical or production control laboratories in general, but it is a serious handicap in a criminological laboratory where the analyst often has little or no information about the type of composition of the material he is required to analyse. To make things more difficult, the amount of the sample is very often so small that he cannot waste part of it for preliminary tests. This is the situation, almost invariably, for paint from hit and run cases, for glass, safe linings, paints etc. from breaking and entering cases.

Generally speaking, the most frequent problem in criminological spectrochemistry is to compare the chemical composition of a small sample with that of a material generally available in good quantity, allegedly to be the source from which the small sample came. For this type of analysis it is not necessary to apply the general procedure of calculating the actual percentages of the individual elements. An arbitrary function of the percentages will be sufficient for the purpose of establishing identity or non-identity or similarity, without any loss in accuracy. The principle of this spectrochemical comparison is quite simple.

Let us consider the fundamental relationship on which spectroanalysis is based.

$$\text{Log } C_A = K_1 \log \frac{I_S}{I_A} + K_2 \qquad (1)$$

C_A is the percentage of the element A

K_1 is a constant, approximately equal to unity

K_2 is another constant, dependent on many factors, such as excitation, type of analytical line and others.

I_A is the intensity of an analytical line of the element A

I_S is the intensity of a line of the internal standard element S

Relationship (1) can be written in a simplified form.

$$C_A = f \frac{I_A}{I_S} \qquad (2)$$

which is a mathematical way of stating that to one value of the ratio $\frac{I_A}{I_S}$ corresponds one value of C_A.

An immediate deduction from relationship (2) is that samples of the same material, analyzed according to the same procedure, have the same $\frac{I}{I_S}$ ratio for all the components. Conversely, if $\frac{I}{I_S}$ is the same for both samples, and so are $\frac{I_B}{I_S}$ — $\frac{I_C}{I_S}$ — etc.—where B, C, . . . are other elements—it can be said that the elements A, B, C . . . are contained in the same percentages in both samples.

The greatest advantage in using $\frac{I}{I_S}$ ratios instead of percentages, which are unnecessary for comparison purposes, is the elimination of standards; this is a very important circumstance in a criminological laboratory, where many times it would be very difficult, if not impossible, to have satisfactory standards for every type of material.

Practical Case of Analysis

Sample: lead—barium glass—NBS 89.

A preliminary examination showed the presence of one or more lines of the following elements: Si, Ti, Fe, Al, Mn, Ca, Mg, Ba, Pb, K, Na, As.

A motion plate study indicated that said elements could be divided in three groups:

1. Volatile elements: Pb, As, Na, K.
2. Medium volatility elements: Ca, Mg, Ba.
3. Refractory elements: Si, Ti, Fe, Al, Mn.

A survey of the lines of these elements indicated as possible analytical lines for a 5 mg. sample the following ones:

1. Pb 2628.3—K 3446.4—Na 3303.0—As 2780.2
2. Ca 3181.3—Mg 2779.8—Ba 2335.3
3. Si 2443.4—Ti 3242.0—Fe 2599.4—Al 3082.2—Mn 2605.7

The lines were considered suitable when they could be read on the second or on the third step of the 3 step filter.

Lead, calcium and silicon were taken as internal standards for the 1, 2 and 3 groups respectively. This choice is arbitrary; any other element in this same group would be satisfactory.

The following exposures were taken on a S–A. No. 1 plate:

Numbers 1, 2, 3, 4 and 5 (5 mg. samples) — D. C. arc—12 amps short circuit, total burning—

Numbers 6, 7, 8 and 9 (5 mg. samples + 5 mg. graphite) — 3 step weakener.

Number 10—iron spectrum for calibration, low amperage, 7 step weakener.

Intensity ratios were obtained by conversion of densitometer readings to intensities by means of calibration.

The values of these ratios, the average values and the average deviations are shown in the following tables.

$\frac{I}{I_S}$ ratios, average deviations for Antimony, Bismuth and Lead in a Tin base bearing metal are reported in Table 2.

It can be seen in the following tables that when the average value of four or five determinations are considered, the average deviations are of the order of $\pm 5\%$ with occasional ones up to $\pm 10\%$. Similar results are obtained with most materials.

Higher accuracy can be obtained only with spark analysis of metals, but this technique is seldom applicable in criminological cases, because of the special shapes required for the standards.

Lower reproducibility is experienced with smaller or irregular burning samples (e. g., small flakes of paint). Average deviations should be calculated and considered a measure of how far an analyst can go in distinguishing similar materials.

The principle of comparative analysis presented in this paper is applicable to the detection and quantitative estimation of traces of accidentally present or unusual elements, whose interpretation is of the greatest importance in origin determination problems.

TABLE 1
Study of Reproducibility of $\frac{I}{I_S}$ ratios for Lead-Barium Glass NBS 89

Analysis: SiO_2 65.35—PbO 17.50—K_2O 8.40—Na_2O 5.70—BaO 1.40
TiO_2 .01—Fe_2O .049—Al_2O_3 .18—CaO .21—MgO .03
P_2O_5 .23—MnO .088—As_2O_5 .36

1, 2, 3, 4, 5 — 5 mg. sample
6, 7, 8, 9 — 5 mg. sample + 5 mg. graphite

Determination	Ti3242.0 / Si2443.4	Fe2599.4 / Si2443.4	Al3082.2 / Si2443.4	Mn2605.7 / Si2443.4	Mg2779.8 / Ca3181.3	Ba2335.3 / Ca3181.3	Na3303.0 / Pb2628.3	As2780.2 / Pb2628.3
1	193	180	170	150	98	65	52	70
2	220	170	160	145	94	62	60	105
3	180	175	160	145	107	67	57	94
4	195	180	187	145	82	66	58	94
5	195	175	170	145	98	64	54	98
Average of 1, 2, 3, 4, 5	196	176	170	146	96	65	56	92
Average Deviation	±9	±4	±7	±2	±6	±1.4	±3	±9
6	180	215	200	150	64	155	51	84
7	180	210	195	150	68	156	50	84
8	175	195	195	140	68	156	47	84
9	170	195	200	140	76	180	49	94
Average of 6, 7, 8, 9	176	203	195	145	69	161	49	86
Average Deviation	±4	±9	±2.5	±5	±3.5	±9	±1	±3.5

TABLE 2

Study of Reproducibility of $\frac{I}{I_S}$ ratios for Tin base bearing metal

Samples 1, 2, 3, 4 and 5 — 5 mg. sample
6, 7 and 8 — approxi. ½ mg. sample

	$\frac{\text{Sb } 2612.3}{\text{Pb } 2873.1}$	$\frac{\text{Bi } 3067.7}{\text{Pb } 2873.1}$
1	160	140
2	155	125
3	157	140
4	150	140
5	160	130
Average of 1, 2, 3, 4, 5	158	135
Average Deviation	±5	±6
6	225	38
7	190	38
8	250	30
Average of 6, 7, 8	222	36
Average Deviation	±20	±3

Summary

The fundamental requirements of forensic spectrochemistry are outlined. A procedure of comparative analysis is presented; its advantages and limitations are discussed.

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The Medico-Legal Application of the Serum Transaminase Test*

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The development and application of the Serum Glutamic Oxalacetic Transaminase (SGO-T) test has proved to be one of the major advances in laboratory and clinical medicine. This is a biochemical test which has found application, over the last 24 months, in pathologic states of the brain, liver and heart. There has been particular reference to its use as an index of myocardial damage, as in coronary heart disease, with and without confirmation by electrocardiogram. The positive transaminase test may precede by hours or even days a positive electrocardiogram. The latter may even remain negative in frankly demonstrable clinical evidence of myocardial damage.

The basis of the transaminase test, as applied to cardiac pathology, consists of the release of an enzyme, glutamic oxalacetic transaminase, into the blood stream, in the presence of myocardial, hepatic, etc. (1, 2, 8) damage and necrosis, based on heavy concentrations of the enzyme in certain organs (8) (see Table 1). This enzyme may be determined quantitatively, colorimetrically or photometrically, in terms of Frankel units. Normal values have been determined at 8–40 units, borderline 40–50, and post-infarctive states at 40 to 200 plus. The 200 unit level bears a serious prognostic significance.

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Table 1

Glutamic Oxalacetic Transaminase in Normal Adult Tissue Homogenates

Tissue	Units SGO-T/gm. wet tissue
Heart	156,000
Liver	142,000
Skeletal muscle	99,000
Kidney	91,000
Pancreas	28,000
Spleen	14,000
Lung	10,000
Serum	20

In our laboratories, we have been able to present, in over 300 determinations, an excellent corroboration between the transaminase serum levels and the clinical picture. Our findings are in agreement with the published reports on brain, liver and cardiac pathology. In addition, the test is an excellent index of peripheral voluntary muscle damage and can be applied in this area to medicolegal problems. Wroblewski (2) in his initial tests on 30 patients with myocardial infarction showed all with 100 to 6000 transaminase units at some time in the five days after onset. Within 6 to 72 hours after infarction, SGO-T values rise 2 to 20 times the normal (1, 3, 4). The values rose in 6 to 48 hours after myocardial injury in animals subjected to injection of plastic microspherules into the coronary circulation (1, 3, 5). This elevation was roughly proportional to the discovered amount of myocardial necrosis. However, myocardial ischemia of 45 minutes duration, produced by ligation of coronary arteries in experimental animals, did not influence the serum level of glutamic oxalacetic transaminase (5). The enzyme activity of infarcted heart muscle was found to be only 2 to 10 per cent that of normal muscle (5). This would indicate the mechanism of elevation of serum transaminase is probably through release of the enzyme into the blood stream following an increase in the permeability of the injured heart muscle cell.

SGO-T is unaffected by angina pectoris, coronary insufficiency, heart failure, digitalization and anticoagulants, in the absence of active heart muscle cell damage (6). In the differential diagnosis of myocardial infarction, SGO-T contributes in the differentiation between pericarditis, myocarditis, pulmonary infarction and myocardial infarction. Elevated values may be expected to return to normal in 2 to 4 days.

The possibility of the extension and application of the transaminase test on cadaver blood for the determination of antemortem myocardial damage, is evident. However, inasmuch as the transaminase enzyme is released into the blood stream in the presence of degenerating and dead myocardium, and other organs (8) (see Table 1) there may well be an identical release of the enzyme in the terminal and post-mortem state by myocardium and other tissues in noncardiac deaths. If so, this would definitely interfere with the use and application of the transaminase tests as an indicator of true antemortem cardiac pathology, using blood secured in the post-mortem phase.

A series of 44 bloods was removed from cadavers at varying intervals post-mortem, in clinically known conditions cardiac and noncardiac. Ten of these were further substantiated by autopsy. Four of the bloods were secured by intra-cardiac aspiration. Others were derived from the femoral or axillary veins. In two, specimens were secured from both heart and the femoral or axillary veins. Determinations of transaminase were made on these bloods at varying times of sequence of individual specimens, after removal from the body. For study purposes, these cases have been arranged into two separate groups.

Group 1. Intra-cardiac post-mortem blood (4 cases).

(a) Without femoral blood evaluation, no autopsy.
   1. Fracture of neck—3 days duration, sudden death—900 units.
   2. Ruptured gastric ulcer—2 days plus duration—1200 units.

(b) Without femoral blood evaluation, autopsy performed.
   1. Traumatic subdural hematoma—3 days duration—900 units.

(c) With femoral blood evaluation, autopsy performed.
1. Ulcerative esophagitis with hemorrhage, hypoplasia of myocardium, dilatation of right heart—1200 units (cardiac); 280 units femoral.

These observations show the transaminase values on varying post-mortem bloods to undergo very rapid elevations on intra-cardiac blood, without a corresponding elevation in peripheral blood. In two cases, intra-cardiac blood levels in excess of 900 units were observed in specimens taken within 60 minutes after death, values generally considered incompatible with life as related to any antemortem cardiac pathology. These two cases, incidentally, were noncardiac cases.

Group 2. Femoral or axillary blood.

(a)	With autopsy (8 cases)	
	1. Reticulum-cell sarcoma of mediastinum	14 units
	2. Adenocarcinoma of pancreas	32 units
	3. Rupture of pelvis, hemothorax, minutes duration	15 units
	(blood in hemothorax from this case)	17 units
	4. Coronary occlusion, 8 plus hours	28 units
	5. Coronary thrombosis, 2 hours	32 units
	6. Coronary arteriosclerosis with occlusion, 36# hours	840 units
	7. Dissecting aneurysm of aorta, 40 plus hours	440 units
	8. Mesenteric thrombosis, 24 plus hours	1100# units
(b)	Without autopsy (32 cases)	
	1. Cerebral hemorrhage (plus months)	
	(leg showing extensive gangrene)	2000# units
	2–4 Cerebral hemorrhage (3 cases) 3, 8 & 11 days	184, 65 & 121 units
	5–8 Cardiovascular renal disease (4 cases) zero time to 20 years	22 to 840 units
	9–10 Pulmonary embolism (2 cases) 3 to 74 hours	28 to 360 units
	11–18 Coronary heart disease (8 cases) 0 hrs–# yrs	15 to 2100 units
	19–32 Others (14 cases) 6 hrs to plus years	18 to 2400 units

From the above autopsied cases, it will be noted that there is a small but appreciable number of cases, where, in the absence of brain, liver or cardiac pathology, there may be an elevation of peripheral blood transaminase values. This should probably be ascribed to prolonged agonal or shock states. This was also observed by Wroblewski (2) in two "false-positive" tests in noncardiac cases, one patient being in a moribund condition and the other suffering from shock. These values are also found elevated and remain elevated in

post-mortem peripheral blood in known clinical cases of cardiac degenerative effects, where the clinical time interval before death is at least 6 hours.

Tests on the bloods obtained in a small series showed that there was no material change in transaminase values of a given sample over a period of 15 days, in a sterile, clotted specimen. Wroblewski (2) gives a time of 3 days before any change. Hemolyzed specimens were found to give uselessly high transaminase values. Blood specimens deteriorated rapidly when contaminated with organisms, and were inactive and worthless when contaminated with formalin.

Summary and Conclusion

1. Serum Glutamic Oxalacetic Transaminase (SGO-T) values will be elevated in shock-like and moribund states, irrespective of etiology, of over 6 hours duration.

2. The SGO-T values in peripheral post-mortem blood, of previously clinically well patients dying abruptly, should not be elevated, irrespective of etiology, including myocardial infarction.

3. There is a very rapid, high post-mortem rise of SGO-T in intracardiac blood, in the post-mortem state, under 30 minutes, irrespective of the cause of death. Thus SGO-T determinations on intracardiac, post-mortem bloods are useless in post-mortem differentiation of causes of death.

4. In deaths occurring at least 6 hours after the onset of the clinical picture, in general, post-mortem blood taken from the femoral vein will not reflect the intracardiac rise of SGO-T, and will reflect, differentially, the antemortem SGO-T, and as much by inference, any degenerative pathology of heart muscle, skeletal muscle, liver or brain. The post-mortem SGO-T evaluations are valueless in the clinical case of less than 6 hours duration as in the antemortem SGO-T.

5. In a clinical diagnosis tentative of myocardial insult, of known duration of over 12–24 hours, this may generally be excluded by a normal SGO-T determination on a post-mortem blood taken from the femoral route, without prior embalming.

6. In the absence of authority to perform an autopsy, the serum transaminase values determined on peripheral blood, afford a presumptive index of cardiac myocardial pathology.

7. Medicolegally, SGO-T post-mortem valuations are worthless in the uncontrolled case, the unknown cadaver or those not under known antemortem observation.

8. There is no medicolegal, pathological or clinical substitute for a carefully performed autopsy. The value of such an autopsy is greatly increased by proper choice of supplementary test procedures.

The author wishes to acknowledge the technical assistance of Donald Hough and Alice Harris, M.T. (ASCP), and the cooperation of the Grove, Poe, Sellers, Barbour and Van Scyoc Funeral Homes.

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The El Paso County Program for the Medical Investigation of Sexual Offenses*

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We are all aware of the fact that the accumulation of evidence in forensic medicine serves as much to protect the innocent as to apprehend the guilty. There are few areas where this observation holds as true as in the collection of evidence in the shady and contentious field dealing with sexual offenses.

To sketch the background a little, we were faced with a problem typical of a community which had been rapidly growing. In these communities the large and rapid increase of the population has produced a lag between the habits and mechanisms of law enforcement and the necessities arising from a larger population. Until a few years ago a woman complaining of sexual assault was usually taken to the El Paso General Hospital which has the only emergency room in the community. She was taken there primarily for the purpose of administering emergency treatment which was usually done by the interne on duty. Later on, this interne, to his great surprise, found himself subpoenaed to appear as an expert witness and to give evidence in criminal proceedings. This produced very unsatisfactory results. Some of the internes were not licensed, none of them could properly qualify as an expert. Great numbers of recriminations occurred, so finally the hospital staff and administration refused to give these internes permission to examine any patients brought in by the police

* Presented at the Ninth Annual Meeting of the American Academy of Forensic Sciences, March 1, 1957, Chicago, Illinois.

with the complaint of sexual assault. The situation became more or less untenable until the various interested groups such as the El Paso County Medical Society, the Staff of the El Paso General Hospital, the Sheriff's office, the City Police, the City Health Department and the District Attorney's office got together to work out a plan for the handling of these cases. The plan, as you will see later, was worked out under more or less false assumptions. It was generally thought that the laboratory work such as examinations for seminal stains or blood stains would be the chief problem. For this reason it was agreed that the hospital pathologist should be put in charge of the examinations. A competent gynecologist could have handled the program just as easily.

Some definite financial arrangements were made which were very necessary because, in the state of Texas, an expert can be subpoenaed in a criminal case to give testimony without compensation. This was one of the reasons that, up to this point, it was extremely difficult to find a physician willing to examine these patients. Some equipment was purchased, such as a fluorescent lamp and chemicals to demonstrate seminal fluid. In addition, the other pathologists in town agreed to be available if the hospital pathologist at El Paso General Hospital should be unavailable.

The program has been in effect now for two and a half years and seventy-two complaints have been investigated. When we started the program we expected that we would deal mainly with cases of more or less obvious sexual assault combined even with homicide. The latter, so far, has not occurred. We anticipated that a case like the following one would be the typical case, instead of being the exception.

Case No. 42. Police history: Girl forced into car at gun point. Later, car was driven off road and the girl was forced at gun point to take off her clothes and get in the back seat. The man then raped her. Physical examination showed a fresh laceration to be present in vaginal wall of a type commonly produced by forced penetration of a penis.

It shortly became apparent that the problem was somewhat different and we will now discuss the nature of the cases, breaking them down by age and to a certain extent by social background. In separating the cases into various groups we

were also guided by considerations of legal nature. According to the law in Texas, rape is defined as the carnal knowledge of a woman without her consent, either by force, threats or fraud. The offense is punishable with the maximum of death and not less than five years imprisonment. Statutory rape for all practical purposes consists of intercourse with an unmarried woman under the age of 18. However, from 15 to 18, prior unchastity is acceptable as a defense. It is obvious then that if the complainant was over 18, we had to evaluate the evidence, not only from the standpoint of whether or not there was intercourse, but also whether violence was involved. Between the ages of 15 and 18, the same considerations were necessary. In addition, the question of virginity had to be considered, while in the ages under 15, evidence of intercourse only had to be obtained.

In investigating the individual cases, we followed more or less set procedures. Cases were only accepted for examination if there was a request from the police or sheriff's department. In cases of minors, additional consent of one of the parents was required. As much history as possible was obtained from the police, parents and from the complainants. In examining the complainant, some notes were made about the emotional attitude, shock and especially possible intoxication. The body was carefully checked for any type of injury and the fingernails for the presence of skin particles from scratching the assailant. A routine gynecological examination followed which always included the aspiration of vaginal fluid for microscopic examination. The vaginal fluid was stained by either the Papanicolaou or Gram method; both are excellent stains for spermatozoa. With this method, a considerable number of positive smears for spermatozoa were obtained representing prima facie evidence of intercourse. However, the exact time of intercourse obviously was not determined. In a few cases there was a typical hymenal tear. This was accepted as positive evidence, even when the smear was negative for spermatozoa, as the latter could have been due to the use of contraceptives. An attempt was made to determine the presence or absence of virginity. This is fairly easy in cases of an obviously torn or atrophic hymen. In cases of an intact hymen this decision can be extremely difficult. In most cases

of first intercourse with hemorrhage, and contrary to general belief, the hemorrhages are rarely due to a tear in the hymen, but more commonly due to a small tear in the mucosa, usually of the posterior wall of the vagina and below the hymen. These tears are so superficial that they may easily heal without a scar and will leave no trace of previous intercourse. Auxiliary methods such as the fluorescent lamp and the use of Florence reagent were only rarely resorted to.

The demands on the time of the examiner were not too burdensome, averaging between two and three examinations a month, naturally at the most undesirable hours of the day or, better, night. Court appearances have been limited and not too difficult. We were usually informed by the District Attorney's office of the day for which the trial was set and kept in touch with the office by telephone. This way we arrived in court only very shortly before being put on the stand and usually not more than a half hour's time was wasted in waiting.

I now would like to discuss the actual material and what conclusions we were able to draw from it. The first surprise was the great number of complaints regarding small children (under 10 years of age). We had seventeen of them. These children were usually brought in by the parents who had made a complaint to the police that some person had fondled these children. In these cases our role was usually limited to producing negative evidence, no physical damage having occurred. Most of these complaints arose from households of rather low social standing, of bad housing facilities, frequently with strangers renting rooms and, surprisingly enough, frequently uncles, cousins or other relatives were accused as the guilty party.

Case No. 17. Police history: complainant is mother of little girl. The accused is husband of the complainant and stepfather of the child. Complainant had been suspecting her husband of molesting her little girl and the little girl had been showing up with her genitals red and bruised. The stepfather had been questioned by the complainant but stated he had not bothered the small girl. The little girl is just beginning to talk and in her way of talking she said that her Daddy hurt her and points to her genitals. She says her Daddy hurt her with his hands. Complainant laid a trap. She went out, then tiptoed back just in time to hear the little girl say, "Oh, Daddy."

Complainant ran into the front room where they were and she saw the little girl sitting on a chair and her pants were down to her knees. She says the child's genitals were all red and sore. Complainant accused her husband but he denied it. He left the house. Examination of the external genitals of a 2-year-old girl did not show any evidence of injury. Vaginal smears were taken for microscopic examination and were negative for the presence of spermatozoa.

The statements of these young children usually are not acceptable in court. Frequently the accused, as well as the complaining parents, were under the influence of alcohol when the so-called offense was committed. One significant case was that of a three-year-old girl who was abducted by a stranger and severely injured. This case necessitated a court appearance and the man was sent to the penitentiary for 25 years.

With somewhat advancing ages (between pre-puberty and puberty) the problems change somewhat. In this group, two distinct sub-groups can be made as far as the social level and the background of the complainants are concerned. One group is characterized by the possession of over-suspicious mothers. Very often we are requested to examine girls who had a spat at home, ran away and stayed out all night, sometimes with and sometimes without the company of a juvenile male. But in these cases examination fails to reveal any evidence of sexual activity. These cases also have another difficult aspect. Most of the accused males were seventeen years or younger and, therefore, not subject to regular court procedure.

The second group was completely different and concerned obviously delinquent girls, frequently without parents. These girls were either psychopaths or engaged in some sort of prostitution. In this group the absence of virginity was quite common and although the general circumstances were rather suspicious, we were only occasionally able to prove intercourse.

Case No. 30. Police history: Complainant is a 14-year-old girl. Time: 3 a. m. Complainant went to a party and got very drunk. One boy was going to walk her home. Picked up several others in car. Tells different stories, that the boy she was with first forced her into a car but did not touch her. Later, she states that he did attack her. Down on levee she was attacked by four more boys. She states that this was not the first time she had been drunk, nor the first time she

had intercourse. The boys tell of her actions in the car, lifting her skirts high and showing her legs where she had "Pepsi" tatooed on one leg. Physical examination shows an atrophic hymen. Microscopic examination shows numerous active spermatozoa. Social background: Father: nothing known. Mother: married stepfather. Three younger siblings. Parents do not seem to keep close check on girl. Records on assailants: one juvenile, aged 14; several delinquent records which include aggravated assault, stabbing and attempted rape in another case.

Here are two other examples of the problems encountered in juveniles. These sisters were ten and twelve years of age. Police report: Received call from flop-house that someone was sleeping in the community bathroom and refused to open the door. Investigating officers went to this address and found the door locked. Upon telling the subjects that they were officers the door was opened. The two girls stated that they had gone with two boys (ages 15 and 17) to the address from a park where they had picked up the boys. They stated that they went to the apartment where they had intercourse two times each with each boy. According to the girls they gave their permission. They said they held the boys off with their arms so "they could'nt get in all the way." Physical examination of both girls shows the presence of virginity and microscopic examination of vaginal fluid in both cases was negative for spermatozoa. Social history: Father: in Huntsville State Prison for attempted rape on older daughter who was at that time 11. Siblings: 8. Welfare with this chronically indigent family for the past ten years.

In the group between 15 and 18 we again encountered many angry mothers. In this group appeal to the police was often used to force marriage on the offending male. The attempt was made to produce a sort of legalized shotgun marriage.

Case No. 44. Police report: Girl, age 16, missing three days and came home. States she was walking on street with a cousin about 5:00 p.m. and three young men in a black Ford stopped them and started talking. They did not know the boys by name but had seen them before. The boys took them to Zaragoza, Mexico, where they had a drink. Girls state they did not drink. They went to Ysleta and took the cousin home. Then, two of the boys got out of the car leaving the complainant with the driver. She tried to get out but he caught hold of her dress and pulled her into the car. He drove a short way from there and stopped. He tried to kiss her and to pull her dress up. After struggling with him for some time she was tired out and he forced himself on her. She says he told her he had abused her and that he would marry her. She told him she would use a knife on him. He told her he would marry her in Las Cruces. Physical examination showed a 16-year-old, fully mature female. The external

genitals showed normal development. A small tear was present in the posterior wall of the vestibulum of the vagina. The hymen appeared intact. The entire vulva was inflamed and irritated. Microscopic examination did not reveal any additional information. Disposition: married.

Case No. 37. Police report: Parents came home from Juarez and found girl in bed with accused. They admitted act of intercourse. Parents desire marriage. Physical examination showed a normally developed girl, fifteen years old. There were no signs of injury. The external genitals were normal. A small, fairly recent tear was present in the hymen near the posterior wall of the vagina. Microscopic examination of vaginal smears was negative for spermatozoa. Disposition: marriage.

In this group we also had one of the few cases of genuine rape, which was mentioned at the beginning of the discussion. However, the perpetrator in this specific case was not found and no conviction was obtained.

The group of complainants over eighteen (twenty-one in number) naturally represents the crux of the matter because here usually the supposed rape victim was the complainant herself. In most of these cases the story was more or less the same. It was, namely, that the complainant met the so-called attacker, usually in a bar, got acquainted between the hours of 2:00 a.m. and 4:00 a.m. and asked to be driven home. Evidence of intercourse was frequently positive in these cases but evidence of violence was never very convincing and, under these circumstances, it is not too surprising that no indictments were returned.

Case No. 28. Police report: After drinking at Pete's Bar from 12:00 to 1:00 a.m. she accepted the company of five men, unknown to her, who offered to take her home. Somewhere near the sandhills they stopped and four of the men got out and took a walk while the fifth and driver of the car told her, "You're going to whether you want to or not" and then proceeded to remove part of her clothing. She then stated she resisted the subject for a while but did not scream for help since it would have done no good out there. One man proceeded to rape her and completed the act of sexual intercourse, according to her statements. Physical examination showed a middle-aged woman. The underclothes were not disturbed. A small scratch was present on the surface of the right thigh. The external genitals were normal and mature. The hymen was scarred. There was no evidence of violence and microscopic examination did not reveal any evidence of spermatozoa.

An additional difficulty is that many of the victims, after the first shock had subsided, refused prosecution. However, in one or two adult cases prosecution and conviction was obtained. However, there is no question in my mind that in most of the adult cases the accusations are unfounded and a great many cases can be closed by medical examination.

Summary and Conclusions

This is a report on the joint program of various El Paso County authorities to obtain adequate evidence in complaints of sexual offenses. It permits the following conclusions:

A great number of factors are responsible for these complaints.

In minors, they are bad housing conditions, inter-family feuds and alcohol.

In juveniles, we have the same factors and a pressure factor to obtain marriage.

In adults, again alcohol, delinquency and semi-prostitution are most important.

The genuine attack with rape is extremely rare.

Immediate careful medical examination, as outlined above, is a helpful factor and closes out a great number of cases, protecting many innocents and occasionally helping to convict the guilty. If properly organized, it can be done with a minimum of time lost and inconvenience for the examiner.

I want to express my appreciation for the help given by the Police Department of El Paso County, the Sheriff's Office of El Paso County and the District Attorney's Office in making their files available for this study.

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Book Reviews

PSYCHOPHARMACOLOGY, a symposium, edited by Nathan S. Kline, M.D., Rockland State Hospital, New York, and a group of fourteen contributors. Publication No. 42 of The American Association for the Advancement of Science. Washington, D. C., 1956. Pp. 175. $3.50.

In this book one hundred and sixty-two clearly printed pages serve to present an excellent series of papers and discussions by a group of experts.

The subject of psychopharmacology and its status is objectively viewed at a symposium organized by the American Association for the Advancement of Science and the American Psychiatric Association.

This modest publication is timely and welcome. Much has been and is being written concerning tranquilizing or other drugs affecting behavior. Current literature contains references to research; speculation on areas involved and modes of action. Molecules have been substituted and pushed around. In spite of all this, clinically, we have not advanced very far.

The greater portion of the volume is devoted to chlorpromazine, reserpine and related drugs. The antagonism between mescaline and chlorpromazine is discussed as is the mechanism of action of LSD, serotonin and other drugs.

Each of the ten sections is clear, concise and interestingly presented. The discussions are logical and hold the reader's attention. What is said is factual to the degree possible in the present state of our knowledge.

"Psychopharmacology" is recommended as a worthwhile addition to libraries of medical schools, hospitals, as well as those in psychiatry.

J. A. Mendelson, M.D.

TRANQUILIZING DRUGS, a symposium, edited by Harold E. Himwich, M.D., Galesburg State Research Hospital, Illinois, and twenty-six contributors. Publication No. 46 by The American Association for the Advancement of Science. Washington, D. C., 1957. Pp. 205. $5.00.

This publication is well planned and prepared, and easy to read. The information contained is the substance of a symposium on the subject of tranquilizing drugs cosponsored by the American Psychiatric Association and the American Physiological Society. The participants represent some of the most outstanding workers in the field.

The contents are classified under three general headings encompassing fourteen items in the investigative, rather than the clinical area. All are stimulating and thought provoking. This reviewer would join with the Editor in making note of Dr. C. D. Leake's introduction. It is a brief but excellent presentation on psychopharmacology.

The section by Marrazzi and Hart, as well as that by Handley, et al., which discusses neural pathways and areas affected, is very good. (A recent paper by Austin and Jasper is germane to this subject.)

Employment of psychotogens, tranquilizers and related drugs as investigative tools enhances the value of the book to those engaged in research, and makes interesting reading for others. The fact that several useful drugs are not included does not detract from its worth.

The Editor sums up in "View Points Obtained from Basic and Clinical Symposia on Tranquilizing Drugs." He highlights the pertinent features of the various contributions, and they are many, and points out that much still remains to be accomplished.

This represents advanced work which will find ready acceptance.

J. A. Mendelson, M.D.

HANDBOOK OF LEGAL MEDICINE, by Louis J. Regan, M.D., LL.B., Late Professor of Legal Medicine, University of Southern California, and Alan R. Moritz, M.D., Professor of Pathology, Director of the Institute of Pathology, Western Reserve University. 1956. Pp. 201, $3.90, C. V. Mosby Co., St. Louis.

In the Foreword of this book Mr. Schroeder, commenting on the professions of Law and Medicine states, "Independently the two professions thrive; together they frequently generate incompatibility." Thus it became the objective of the authors to write a handbook of legal medicine which will be brief, concise, and a medium to educate both law and medical students, as well as a working manual for lawyers and physicians. This indeed was accomplished.

The authors of this handbook are outstanding teachers and investigators in Legal Medicine. Although they are familiar with the many texts of legal medicine and medical jurisprudence, it was their considered judgment to write a small and concise handbook on the subject for the undergraduate medical student, and for physicians, lawyers, and law students. The book is divided into two major sections—medical and legal—alphabetical arrangement, and a legal and medical glossary which is most beneficial for the reader.

Part I deals with Physician and Patient—Physician and the Law, starting with the letter A—Abortion, Adoption thru W—Workmen's Compensation, Wrongful Death Actions, in a concise explanation of what these terms mean with particular emphasis on the physician-patient-law relationship. Several pages are devoted to "Do not Fail—Do not Promise" with illustrations which are quite effective in warning the physician to avoid pitfalls which may lead to malpractice suits. The Medical Witness and his Testimony, Statutes of Limitations, Workmen's Compensation, are vignettes of worth-while reading.

Part II, which deals with Scientific Medicolegal Investigation, is a "must" reading for every law and medical student. Here is presented in a succinct manner the pertinent problems that practicing physicians and pathologists encounter. Beginning with "When is a death a coroner's case and why?" the identity of the dead person, time of death, sudden death

from disease, injuries by mechanical violence, injuries and disease, injuries of the head and spine, bullet wounds, mechanical asphyxia and drowning, rape, abortion, injuries by other forms of physical energy, poisoning, and medicolegal aspects of the individuality of the blood, are excellently presented and many sections are illustrated by figures and charts.

This handbook is recommended to the student and practicing physician and lawyer as a valuable working and quick reference manual.

S. L.

TENTATIVE PROGRAM

TENTH ANNUAL MEETING

AMERICAN ACADEMY OF FORENSIC SCIENCES

Hotel Carter — Cleveland, Ohio

February 27, 28, March 1, 1958

Thursday, February 27, 1958

8:00 AM Registration

9:30 AM GENERAL SCIENTIFIC SESSION

Introduction	Russell S. Fisher, M.D. Chairman, Program Committee
Presidential Address	Val B. Satterfield, M.D.

10:30 AM SYMPOSIUM—WHAT'S NEW IN FORENSIC SCIENCE?

Pathology	Lester Adelson, M.D.
Criminalistics	Lowell Bradford, B.Sc.
Toxicology	Robert Forney, Ph.D.
Jurisprudence	Speaker to be announced
Questioned Documents	Donald Doud
Immunology	Speaker to be announced
Psychiatry	Speaker to be announced

12:30 PM Luncheon

2:00 PM SECTION MEETINGS (Business Meeting + Program)

Criminalistics Section
Immunology Section
Jurisprudence Section
Pathology Section

Diffuse Contusion of the Respiratory Tract from Intratracheal Explosion	Robert W. Huntington, M.D.
Histochemical Demonstration of Cholinesterase	Charles S. Petty, M.D.
Infanticide	Lester Adelson, M.D.
Evaluation of the Fractured Hip, Contributory or Noncontributory Factors in Death	J. E. Campbell, M.D.
A Follow-up Study of Fatal Penicillin Anaphylaxis	Abraham Rosenthal, M.D.
Identification of War Dead by Means of Roentgenographic Cephalometry	Viken Sassouni, DFMP, M.Sc.

Thursday, February 27, 1958

Psychiatry Section	
Bench Consultations	R. Burke Suitt, M.D.
Questioned Documents Section	
The Anonymous Letter by Duplicating Process	James R. Durham
Snaring the Poison Pen Writer	J. R. Dibowski
Anonymous Communications	Philip L. Schmitz
The Traveler	Lt. Edwin Schroeder
Toxicology Section	
Gas Chromatography in the Qualitative and Quantitative Study of the Alcohols	R. J. Muelling, M.D., T. K. Farris, M.D., and N. J. Chetta, M.D.
Toxicology of Some New Drugs	A. J. McBay, Ph.D.
Title to be announced	Leo Goldbaum

5:00 PM GENERAL BUSINESS MEETING

Friday, February 28, 1958

9:00 AM SYMPOSIUM—MATHEMATICS AND THE USE OF STATISTICS IN COURT ROOM TESTIMONY

Two 20 minute presentations by forensic scientists
30 minute presentation mathematical background by a statistician or mathematician
10 minutes of discussion
10 minutes—recess

10:30 AM SYMPOSIUM—INVESTIGATION OF SUDDEN, UNEXPLAINED OR OBSCURE DEATHS

Pathology	Marie Valdes-Dapena, M.D.
Psychiatry	
Criminalistics	Charles M. Wilson

2:00 PM Continuation of Symposium

Toxicology	Kurt Dubowski, Ph.D.
Immunology	
Questioned Documents—Analysis of Suicide Notes	C. D. Brooks
Jurisprudence	

4:00 PM Modern Concepts in Investigation of Aircraft Fatalities — Col. Frank Townsend, MC, USAF, and Capt. Vernie Steinbridge, MC, USAF of Armed Forces Institute of Pathology

6:30 PM FELLOWSHIP HOUR

7:30 PM ANNUAL BANQUET

Saturday, March 1, 1958

9:00 AM SECTION MEETINGS (or Joint Meetings of two or more Sections)

Criminalistics	
The Physioprint as a Means of Identification	Viken Sassouni, DFMP, M.Sc.
A Microchemical Procedure for Paint Chip Comparison	Livio L. Vagnina, B.S.
Firearms Discharge Residue	Harold C. Harrison, Ph.D.
Immunology	
Jurisprudence	
Pathology	
Determination of Time of Death from External Factors	Herbert P. Lyle, M.D., and Frank P. Cleveland, M.D.
Post Mortem Biological Changes	Walter W. Jetter, M.D.
Determination of Time of Death by Measurement of Heat Loss from the Body	Frank P. Cleveland, M.D., and Herbert P. Lyle, M.D.
Psychiatry	
Questioned Documents	
Color Photography	Edwin Conrad
Color Photography in Document Examination	Donald Doud
The Need of Accurate Findings and Effective Testimony as a Basis for Progressive Appellate Decisions	Ordway Hilton
Interrogatory Depositions	Linton Godown
Toxicology	